# Infant and Child Mortality in Indonesia

## With an Application of Life Table and Cox Regression Techniques to Infant Mortality

Wendy Hartanto

A thesis submitted for the degree of
Doctor of Philosophy
Demography Program
Division of Demography and Sociology
Research School of Social Sciences
The Australian National University

February, 1998

# Declaration

Except where otherwise indicated, this thesis is my own work undertaken as a scholar in the Demography Program, Division of Demography and Sociology, Research School of Social Sciences, the Australian National University.

Wendy Hartanto

Canberra, February 1998

*For neng arniati, hanum, pandu and nadira*

# Acknowledgements

I wish to thank the Australian Agency for International Development (AusAID) for providing me with financial support to pursue my post-graduate studies in demography in Australia. I am indebted to my office, the Central Bureau of Statistics (CBS) for giving me the chance to pursue this post-graduate degree. I acknowledge the generosity and understanding of my director, Bapak Sugito MA and my previous director Bapak Drs Azwar Rasjid who fully supporting me in this endeavour, and Bapak Soetjipto Wirosardjono MSc (former deputy director of CBS) who encouraged me to pursue the PhD degree. My thanks also goes to Bapak Dr Jopie Bambang Soenjoto, the director of Academy of Statistics who nominate me for the PhD program.

I must thank the staff and students of the Demography Program, Research School of Social Science (RSSS) the Australian National University. I am deeply grateful to my panel chair, Dr Terry Hull, who gave me strong motivation, encouraged and guided me, and always gave me challenging comments. Without his help it would be impossible for me to finish this thesis. I am deeply indebted to my former panel chair Dr Alan Gray and Dr Habtemariam Tesfaghiorghis who provided constructive and substantial input in the development of this work. I am deeply grateful to Professor Peter McDonald (coordinator of the Demography Program) who set aside his time for reading my first draft and gave valuable comments. My sincerest thanks also goes to my adviser, Dr Heather Booth for providing meaningful input in the development of this thesis. My special thanks goes to Professor Gavin Jones and Dr Lorraine Corner who encouraged and gave valuable comment in the early stages of my work.

I acknowledge the technical assistance given by Ms Shu Ung and Ms Virginia Woodland of the Information Technology Services; Mr Hugo Byrne and Mr Chris Patterson of the National Center for Development Studies (NCDS) and Ms Diana Crow and Ms Karen Ewens of the Demography Program for their help in maintaining the computer software to make my work easier. My special thanks goes to Ms Pat Quiggin and Ms Jenny White for their great help in searching the literature and other information required by my course work, and to Ms Milisa Haberschusz and Kay Nantes for their administrative support in my research activities.

I am especially indebted to my liaison officer Ms Lynn Toohey and Ms Helen Simon of International Education Office (IEO), the Australian National University, for their administrative and moral support. Special thanks goes to my former liaison officer Ms Alicia Curtis of AusAID who helped me to break the bureaucracy barrier in the AusAID office in Indonesia, and enabled me continue the PhD program.

I am also grateful to Pak Ida Komang Wisnu (head of social and population statistics division) in East Java for his support during my field work. Many thanks also go to all of the interviewers, field editors and supervisors of the 1994 Indonesia Demographic and Health Survey in East and West Java provinces for their cooperation during my field work.

I am grateful to Mr Stephen Ford who painstakingly proofread and edited the entire thesis. I wish to thank my academic skills lecturer, Ms Marian May, for her guidance during the early stages of this thesis.

I am grateful to the Indonesian Embassy staff for their administration support. I also wish to thank to all of my colleagues, Budi Utomo, Alan Feranil, Djoko Hartono, Chona, Rosalie, Arief, Muhammad Khan, Dayday, Pathak, Nima, Iwu Utomo, Helen Avong, Tapiwa, Lawrence, Narti, Joseph Pitso, Jacob, Arie, Eci, Piti, Prakash, Munir, Makmuri Sukarno, Richard, Tuti and Tina, for sharing their knowledge and their frienship.

I would like to thank to my colleagues from CBS, Agus Setiabudi, Rini, Indra, Yohandarwati, Yusuf Muharram, Tetty, Yeany, Tandjung, Andre, Vivi and all friends of the Indonesian Scholars Association for their friendship during my study.

I would like to specially thank my beloved mother who always devoted her love, encourage, patience, but who unfortunately died while I was studying. I also thank my mother-in-law and all of my relatives for their support, understanding, tolerance, patience and encouragement throughout my career and my study.

My wife, Neng Arniati deserves special recognition for her continuous love, patience, great understanding, and support throughout this period of time. To my children Nirmala Hanum Sari, Muhammad Pandu Wicaksono and Nadira Rachmianti, I owe an immense debt of gratitude, especially for the sacrifice of time which I might have spent with them, and instead, devoted to this work. This thesis is dedicated to them.

Most of all, I thank to Allah S.W.T.

# Abstract

The levels of infant and child mortality in Indonesia have declined considerably since the 1960s, although the decline has not been as rapid as observed in some neighbouring countries. In the last decade, information for estimating infant and child mortality in Indonesia was very limited and as a consequence only indirect estimation techniques were employed. These techniques, however, were inadequate for analysing the effects of the social determinants of infant and child mortality.

The reliability and validity of Indonesian data are not good, particularly the quality of age reporting of deceased children. To estimate infant and child mortality using survey data, methods which utilise reports of all recent births are more 'efficient' than methods using only a portion of these. Cox regression, which utilises the life table concept, maximises the inclusion of cases in the analysis, and thus is preferred as a means of efficiently exploiting survey data to offset weaknesses of mis-reporting and sampling error.

This study first reviews demographic literature to highlight data sources and historical trends of infant and child mortality during the pre and post independence eras. It then employs both indirect techniques and life table and Cox regression analyses to examine the levels, trends, differentials and determinants of infant and child mortality in Indonesia, based on the 1991 and 1994 Indonesia Demographic and Health Surveys (IDHS). Previous studies using pregnancy history and logistic regression excluded the children who were born less than one year before the survey (for analysing infant mortality) or less than five years before the survey (for analysing child mortality). Even though the indirect methods (such as Brass methods) include all of cases in the calculation of estimates, they are heavily dependent on the assumption of stability of fertility and mortality. Brass methods estimate the levels of infant and child mortality but are not easily employed in multivariate analysis. The Cox regression methods can simultaneously evaluate the effect on infant and child mortality of several socio-economic and demographic variables for relatively recent reference periods. Therefore, the infant mortality occurring in the recent past can be associated with the recent socio-economic conditions experienced by respondents. The distribution of survival time can be described in terms of life table survival functions, thus producing more effective summaries of infant and child mortality. The 1980 and 1990 Censuses and the 1985 and 1995 Intercensal Surveys were analysed to describe the trend of infant mortality in the last two decades.

At the national level, infant and child mortality declined significantly between the 1960's and the early 1990's. Based on census data, there are great variations in infant mortality between provinces in Indonesia. Provincial variation is due to the varying levels of female education, availability and accessibility of health services, level of socio-economic development, and cultural factors. As an example, the infant mortality rate drastically decreased in West Nusa Tenggara from 221 per thousand

births in 1967 to 189 in 1976, and to 145 and 101 in 1986 and 1991 respectively. However, based on the 1995 Intercensal Survey, West Nusa Tenggara still reports the highest level of measured mortality, in part due to the relative poverty of the region, but perhaps also because other poor areas are less effective in estimating mortality.

With regard to determinants of mortality, it was found that short preceding birth intervals (less than 19 months) were significantly associated with higher infant and child mortality. The findings suggest that the effects of this variable were independent of the survival status of the preceding child. Higher mother's age at first marriage was more important in reducing infant mortality than mother's age at child birth. Maternal age at child birth and birth order of the child had independent effects on infant mortality.

A tetanus injection during pregnancy and assistance at delivery are crucial factors affecting infant mortality. However, size of the babies and the initiation of a prenatal check had only significantly affected infant mortality in rural areas.

This study indicates that the parental educational attainment is a crucial factor in a child's survival. The mother's education is more important in reducing child mortality than infant mortality. Differentials of household socio-economic status had highly significant effects in reducing infant mortality although less effect in reducing child mortality. The effects were independent of place of residence. Sanitation factors such as source of drinking water and type of toilet significantly affected infant and child mortality in both urban and rural areas.

The study concluded that efforts to reduce infant and child mortality should include: 1) a family planning program that promotes longer spacing between births; 2) promotion of women's educational attainment; 3) increasing the utilisation of health services; 4) promoting public health awareness through media, especially newspapers and written materials; 5) improving sanitary facilities through access to clean drinking water and better disposal of waste.

The study suggests that the government should increase the budget of the health sectors which is low in comparison with other ASEAN countries, and target resources predominantly to low-income people and poor provinces. In addition, the government should increase the priority of preventive care relative to curative care overall while still improving low level referral hospitals to make them more effective in the curative program. Low-income people and poor provinces experienced the highest infant and child mortality levels in Indonesia, and this seem to be strongly correlated to lack of skilled medical personnel and low budgets for effective health services of both preventive and curative forms.

Further research on mortality determinants is still needed, especially at the provincial level. Quantitative and qualitative research should be coordinated in order to refine our understanding of the reasons behind high infant and child mortality and clarify how these impact on our ability to measure mortality effectively.

# Contents

| | |
|---|---|
| **Acknowledgements** | **iv** |
| **Abstract** | **vi** |
| **List of tables** | **xii** |
| **List of figures** | **xiv** |
| **List of appendices** | **xvi** |
| **Acronyms and glossary** | **xx** |
| **Chapter 1 Introduction** | **1** |
| 1.1 Background | 1 |
| 1.2 The research problems | 3 |
| 1.3 Objective of the thesis | 4 |
| 1.4 Importance of the study | 5 |
| 1.5 Review of the literature | 6 |
| 1.5.1 Demographic differentials in infant and child mortality | 6 |
| Maternal age | 6 |
| Sex of the child | 7 |
| Birth order | 8 |
| Birth interval | 9 |
| Multiple birth | 11 |
| 1.5.2 Socio-economic determinants of infant and child mortality | 11 |
| Parental education | 12 |
| Household income | 15 |
| Housing conditions | 15 |
| Place of residence | 16 |
| 1.6 Analytical framework | 18 |
| 1.7 Organisation of the study | 22 |
| 1.8 Summary | 22 |
| **Chapter 2 Data and methodology** | **24** |
| 2.1 Introduction | 24 |
| 2.2 Description of the global program of Demographic and Health Surveys | 24 |
| 2.3 Source of the data | 25 |
| 2.3.1 Coverage and sample design of the 1991 and 1994 Indonesia Demographic and Health Surveys | 25 |
| 2.3.2 Questionnaire | 27 |
| 2.3.3 Fieldwork | 29 |
| 2.4 Limitation and quality of the data | 30 |

2.4.1 Completeness and quality of age reporting 31

2.4.2 Omission of births and deaths and information relating to births and deaths 37

2.4.3 Advantages and disadvantages of the pregnancy history technique 39

2.5 Method of analysis 40

2.5.1 Characteristics of survival data and censoring 41

2.5.2 Life table analysis 42

Testing the difference between survival curve 45

2.5.3 Cox regression analysis 46

Multiplicative risk function 47

2.5.4 Limitation of analysis 48

2.6 Summary 48

**Chapter 3 Country background and health development in Indonesia 50**

3.1 Background 50

3.1.1 Urbanisation 52

3.1.2 Transmigration 53

3.1.3 Administrative structure 54

3.1.4 Economy 54

The recent economic condition 57

3.1.5 Education 59

3.2 Health development in Indonesia 60

3.2.1 Introduction 60

3.2.2 Health facilities 63

3.2.3 Community participation in health services 66

3.2.4 Health manpower 68

3.2.5 Health financing 69

3.2.6 Family planning 70

3.3 Summary 73

**Chapter 4 Levels and trends of infant and child mortality 75**

4.1 Introduction 75

4.2 Historical sources of information on infant and child mortality in Indonesia 76

4.3 Earlier mortality estimates 79

4.3.1 Mortality prior to the 1961 Census 79

4.4.2 Mortality after the 1961 Census 82

4.4 Mortality trends 84

4.5 Survival function during infancy 87

4.6 Variation in infant mortality among provinces 91

4.7 Summary 94

**Chapter 5 Survival function and level of infant and child mortality by socio-demographic factors** **95**

5.1 Introduction 95
5.2 Sex of the child and birth cohort 95
5.3 Preceding interval and survival status preceding child 98
5.4 Maternal age at first marriage, maternal age at child birth, and birth order of the index child 102
5.5 Maternal and paternal education 107
5.6 Place of residence and socio-economic factors 110
5.7 Housing indicators 116
5.8 Health care factors 122
5.9 Summary 124

**Chapter 6 Effects of proximate determinants on infant mortality** **126**

6.1 Introduction 126
6.2 Variable used 127
6.2.1 Demographic factors 128
6.2.2 Socio-economic factors 128
6.2.3 Household facilities 128
6.2.4 Health care factors 132
6.3 The effects of demographic factors 134
6.4 The effects of regional factors 140
6.5 The effects of socio-economic factors 143
6.6 The effects of housing factors 149
6.7 The effects of sanitation factors 151
6.8 The effects of prenatal care and childbirth factors 153
6.9 The effects of socio-economic and demographic factors 156
6.10 Summary 160

**Chapter 7 Provincial variation in infant mortality** **163**

7.1 Introduction 163
7.2 Mortality among groups of island 163
7.3 Mortality according to provinces 166
7.3.1 Low level of infant mortality 166
7.3.2 Medium level of infant mortality 169
7.3.3 High level of infant mortality 174
7.4 Infant mortality differential by place of residence 177
7.5 Relative risk of infant mortality among provinces 178
7.6 Socio-economic and demographic differential in infant mortality among provinces 180
7.6.1 Demographic determinants 180
7.6.2 Socio-economic determinants 181

7.6.3 Correlation of infant and child mortality with other variables in the provinces 186

7.7 Summary 187

**Chapter 8 Conclusion and policy implications 188**

8.1 Methods 188

8.2 Mortality trends 190

8.3 Policy implications 193

**References 195**

**Appendix tables 208**

# List of tables


| | | |
|---|---|---|
| Table 2.1 | Sample coverage according to province, 1991 and 1994 Indonesia Demographic and Health Surveys (IDHS) | 27 |
| Table 2.2 | Mean number of children ever born to ever-married women and proportion of deaths according to age of mother, Indonesia | 39 |
| Table 3.1 | Percentage and density per square km of population in Java and outer Java, Indonesia 1961-95 | 51 |
| Table 3.2 | School participation rates according to age group, sex and area, 1990 and 1995 | 60 |
| Table 3.3 | Comparative infant mortality rate and life expectancy between Indonesia and selected countries, 1994 | 61 |
| Table 3.4 | Comparative hospital bed ratios | 65 |
| Table 3.5 | Comparative health expenditure ratios among ASEAN countries | 70 |
| Table 3.6 | Target and actual new users of the family planning program during the first long-term development, Indonesia 1969-94 | 72 |
| Table 3.7 | Percentage of new users of family planning program according to method of contraceptives during first long-term development | 73 |
| Table 4.1 | Estimates of infant mortality rate according to method of estimation and source of data Indonesia, 1926-58 | 81 |
| Table 4.2 | Estimates of infant mortality rate according to method of estimation and source of data Indonesia, 1960-91 | 83 |
| Table 4.3 | The infant mortality rates in Indonesia provinces, 1971-90 | 92 |
| Table 5.1 | Infant and child mortality rates according to sex and birth cohort of the child, Indonesia 1979-94, 1994 IDHS | 96 |
| Table 5.2 | Infant and child mortality rates according to preceding birth interval and survival status of preceding child, Indonesia 1984-94, 1994 IDHS | 100 |
| Table 5.3 | Infant and child mortality rates according to birth interval and survival status of preceding child, Indonesia 1984-94, 1994 IDHS | 101 |
| Table 5.4 | Infant and child mortality rates according to maternal age at child birth, maternal age at first married, and birth order, Indonesia 1984-94, 1994 IDHS | 103 |
| Table 5.5 | Infant and child mortality rates according to birth order and maternal age, Indonesia 1984-94, 1994 IDHS | 106 |
| Table 5.6 | Infant and child mortality rates according to maternal and paternal education, Indonesia 1984-94, 1994 IDHS | 109 |

| | | |
|---|---|---|
| Table 5.7 | Infant mortality rates according to socio-economic factors and place of residence, Indonesia 1984-94, 1994 IDHS | 112 |
| Table 5.8 | Child mortality rates according to social factors and place of residence, Indonesia 1984-94, 1994 IDHS | 113 |
| Table 5.9 | Infant mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS | 117 |
| Table 5.10 | Child mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS | 118 |
| Table 5.11 | Infant mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS | 119 |
| Table 5.12 | Child mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS | 120 |
| Table 5.13 | Infant mortality rates according to health care factors and place of residence, Indonesia 1989-94, 1994 IDHS | 123 |
| Table 6.1 | Independent variable used in the Cox regression analysis | 131 |
| Table 6.2 | The relative risk of demographic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 135 |
| Table 6.3 | The relative risk of demographic factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS | 137 |
| Table 6.4 | The relative risk of regional factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 141 |
| Table 6.5 | The relative risk of regional factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS | 142 |
| Table 6.6 | The relative risk of socio-economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 144 |
| Table 6.7 | The relative risk of socio-economic factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS | 145 |
| Table 6.8 | The relative risk of socio-economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 147 |
| Table 6.9 | The relative risk of socio-economic factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS | 148 |
| Table 6.10 | The relative risk of housing factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 150 |
| Table 6.11 | The relative risk of housing factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS | 151 |
| Table 6.12 | The relative risk of sanitation factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 152 |

| | | |
|---|---|---|
| Table 6.13 | The relative risk of sanitation factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS | 153 |
| Table 6.14 | The relative risk of mortality associated with pregnancy care, birth assistance and baby's size, Indonesia, 1991 and 1994 IDHS | 154 |
| Table 6.15 | The relative risk of pregnancy, birth assistance and baby's size on infant mortality according to place of residence, Indonesia, 1994 IDHS | 156 |
| Table 6.16 | The relative risk of socio-economic and environment factors contributing to infant mortality, Indonesia, 1994 IDHS | 157 |
| Table 6.17 | The relative risk of demographic, socio-economic and environment factors contributing to infant mortality, Indonesia, 1994 IDHS | 159 |
| Table 7.1 | Distribution of treatments facilities used by people who were sick according to groups of island, 1992 | 165 |
| Table 7.2 | Infant mortality according to place of residence and province, Indonesia 1984-94, 1994 IDHS | 173 |
| Table 7.3 | The relative risk of infant mortality according to province, Indonesia 1984-94, 1994 IDHS | 179 |
| Table 7.4 | The relative risk of selected demographic and socio-economic variables on infant mortality according to province, Indonesia, 1994 IDHS | 182 |
| Table 7.5 | The relative risk of selected socio-economic and sanitation variables on infant mortality according to province, Indonesia, 1994 IDHS | 184 |
| Table 7.6 | Correlation coefficient between infant and child mortality rate and selected variables among provinces in Indonesia, 1994 IDHS | 186 |

# List of figures

| | | |
|---|---|---|
| Figure 1 | Analytical framework for the study of infant and child mortality determinants in Indonesia | 21 |
| Figure 2.1 | Number of reported deaths among children under two years according to age at death and birth cohort, 1991 IDHS | 33 |
| Figure 2.2 | Number of reported deaths among children under two years according to age at death and birth cohort, 1994 IDHS | 34 |
| Figure 2.3 | Number of reported deaths among children under two years according to age at death and education of mother, 1991 IDHS | 34 |

| | | |
|---|---|---|
| Figure 2.4 | Number of reported deaths among children under two years according to age at death and education of mother, 1994 IDHS | 35 |
| Figure 2.5 | Age distribution of ever married women, according to education, 1991 IDHS | 35 |
| Figure 2.6 | Age distribution of ever married women, according to education, 1994 IDHS | 36 |
| Figure 2.7 | Age distribution of ever married women, according to place of residence, 1991 IDHS | 36 |
| Figure 2.8 | Age distribution of ever married women, according to place of residence, 1994 IDHS | 37 |
| Figure 3.1 | National inflation, 1951-1968 (per cent) | 55 |
| Figure 3.2 | National inflation, 1968-94 (per cent) | 55 |
| Figure 3.3 | Percentage of deliveries according to type of attendance, Indonesia: 1992-94 | 63 |
| Figure 4.1 | Indirect estimate of infant mortality $q_{(1)}$ using Coale-Demeny West Model, based on the 1980, 1990 Censuses, and the 1985, 1995 Intercensal Surveys | 86 |
| Figure 4.2 | Proportion dead, based on the 1980, 1990 Censuses and the 1985, 1995 Intercensal Surveys | 86 |
| Figure 4.3 | Survival function among group of islands and Indonesia urban/rural 1994 IDHS | 88 |
| Figure 4.4 | Survival function in the first year of life among children according to provinces in group of islands in Indonesia, 1994 IDHS | 90 |
| Figure 5.1 | Survival function of infant according to sex of the child, Indonesia 1984-94, 1994 IDHS | 97 |
| Figure 5.2 | Survival function of infant according to birth cohort, Indonesia 1979-94, 1994 IDHS | 97 |
| Figure 5.3 | Survival functions of infants according to the survival status of preceding child, Indonesia 1984-94, 1994 IDHS | 102 |
| Figure 5.4 | Infant mortality rates according to birth order and age of mother at child birth and at first marriage, Indonesia 1984-94, 1994 IDHS | 105 |
| Figure 5.5 | Survival function of infants according to parental education, Indonesia 1984-94, 1994 IDHS | 110 |
| Figure 5.6 | Survival function of infants according to the ability of the mother to read letters/newspapers and place of residence, Indonesia 1984-94, 1994 IDHS | 115 |
| Figure 5.7 | Survival function of infants according to the ability of the mother to speak Indonesian language and place of residence, Indonesia 1984-94, 1994 IDHS | 115 |

| | | |
|---|---|---|
| Figure 5.8 | Survival function of infants according to the source of drinking water and place of residence, Indonesia 1984-94, 1994 IDHS | 121 |
| Figure 5.9 | Survival function of infants according to the toilet facilities and place of residence, Indonesia 1984-94, 1994 IDHS | 122 |
| Figure 7.1 | Infant and child mortality among groups of islands of Indonesia, 1989-94 | 164 |


# List of appendix tables


| | | |
|---|---|---|
| Table A.3.1 | National inflation according to expenditure group, 1951-68 | 208 |
| Table A.3.2 | National inflation according to expenditure group, 1969-94 | 209 |
| Table A.3.3 | Percentage of delivery assistance, Indonesia, 1992-94 | 209 |
| Table A.3.4 | Provincial distribution of community health resource, Indonesia, 1987 | 210 |
| Table A.3.5 | Provincial distribution of beds per 1000 population and doctors per bed, Indonesia, 1985 | 211 |
| Table A.4.1 | Indirect estimate of infant mortality $q_{(1)}$ using Coale-Demeny West Model, based on the 1980, 1990 Censuses and 1985, 1995 Intercensal Surveys | 212 |
| Table A.4.2 | Proportion dead, Indonesia, based on the 1980, 1990 Censuses and 1985, 1995 Intercensal Surveys | 212 |
| Table A.4.3 | Survival function of children during first year of life according to group of islands in Indonesia, 1984-94 | 213 |
| Table A.4.4 | Survival function of children during first year of life according to place of residence of Indonesia, 1984-94 | 213 |
| Table A.4.5 | Survival function of children during first year of life according to provinces in Sumatra island, 1984-94 | 214 |
| Table A.4.6 | Survival function of children during first year of life according to provinces in Java-Bali island, 1984-94 | 214 |
| Table A.4.7 | Survival function of children during first year of life according to provinces in Kalimantan island, 1984-94 | 215 |
| Table A.4.8 | Survival function of children during first year of life according to provinces in Sulawesi island, 1984-94 | 215 |
| Table A.4.9 | Survival function of children during first year of life according to provinces in Eastern Indonesia islands, 1984-94 | 216 |
| Table A.5.1 | Life table for infant survival, Indonesia, 1994 IDHS | 217 |

| | | |
|---|---|---|
| Table A.5.2 | Life table for infant survival for sex of the child = male, Indonesia, 1994 IDHS | 217 |
| Table A.5.3 | Life table for infant survival for sex of the child = female, Indonesia, 1994 IDHS | 218 |
| Table A.5.4 | Life table for infant survival for birth cohort = 0-5 years before the survey, Indonesia, 1994 IDHS | 218 |
| Table A.5.5 | Life table for infant survival for birth cohort = 5-10 years before the survey, Indonesia, 1994 IDHS | 219 |
| Table A.5.6 | Life table for infant survival for birth cohort = 10-15 years before the survey, Indonesia, 1994 IDHS | 219 |
| Table A.5.7 | Life table for infant survival for preceding birth interval = <19 months and survival status of previous child = alive, Indonesia, 1994 IDHS | 220 |
| Table A.5.8 | Life table for infant survival for preceding birth interval = 19-36 months and survival status of previous child = alive, Indonesia, 1994 IDHS | 220 |
| Table A.5.9 | Life table for infant survival for preceding birth interval = 37+ months and survival status of previous child = alive, Indonesia, 1994 IDHS | 221 |
| Table A.5.10 | Life table for infant survival for preceding birth interval = <19 months and survival status of previous child = death Indonesia, 1994 IDHS | 221 |
| Table A.5.11 | Life table for infant survival for preceding birth interval = 19-36 months and survival status of previous child = death Indonesia, 1994 IDHS | 222 |
| Table A.5.12 | Life table for infant survival for preceding birth interval = 37+ months and survival status of previous child = death Indonesia, 1994 IDHS | 222 |
| Table A.5.13 | Life table for infant survival for education of mother = no education/some, Indonesia, 1994 IDHS | 223 |
| Table A.5.14 | Life table for infant survival for education of mother = complete primary, Indonesia, 1994 IDHS | 223 |
| Table A.5.15 | Life table for infant survival for education of mother = complete secondary+, Indonesia, 1994 IDHS | 224 |
| Table A.5.16 | Life table for infant survival for education of father =no education/some, Indonesia, 1994 IDHS | 224 |
| Table A.5.17 | Life table for infant survival for education of father = complete primary, Indonesia, 1994 IDHS | 225 |
| Table A.5.18 | Life table for infant survival for education of father = complete secondary+, Indonesia, 1994 IDHS | 225 |
| Table A.5.19 | Life table for infant survival for ability to read newspaper = easily and place of residence = urban, Indonesia, 1994 IDHS | 226 |

| | | |
|---|---|---|
| Table A.5.20 | Life table for infant survival for ability to read newspaper = not at all/difficulty and place of residence = urban, Indonesia, 1994 IDHS | 226 |
| Table A.5.21 | Life table for infant survival for ability to read newspaper = easily and place of residence = rural, Indonesia, 1994 IDHS | 227 |
| Table A.5.22 | Life table for infant survival for ability to read newspaper = not at all/difficulty and place of residence = rural, Indonesia, 1994 IDHS | 227 |
| Table A.5.23 | Life table for infant survival for ability to speak Indonesian language = yes and place of residence = urban, Indonesia, 1994 IDHS | 228 |
| Table A.5.24 | Life table for infant survival for ability to speak Indonesian language = no and place of residence = urban, Indonesia, 1994 IDHS | 228 |
| Table A.5.25 | Life table for infant survival for ability to speak Indonesian language = yes and place of residence = rural, Indonesia, 1994 IDHS | 229 |
| Table A.5.26 | Life table for infant survival for ability to speak Indonesian language = no and place of residence = rural, Indonesia, 1994 IDHS | 229 |
| Table A.5.27 | Life table for infant survival for source of drinking water = pipe water and place of residence = urban, Indonesia, 1994 IDHS | 230 |
| Table A.5.28 | Life table for infant survival for source of drinking water = pump, protective well and place of residence = urban, Indonesia, 1994 IDHS | 230 |
| Table A.5.29 | Life table for infant survival for source of drinking water = others and place of residence = urban, Indonesia, 1994 IDHS | 231 |
| Table A.5.30 | Life table for infant survival for source of drinking water = pipe water and place of residence = rural, Indonesia, 1994 IDHS | 231 |
| Table A.5.31 | Life table for infant survival for source of drinking water = pump, protective well and place of residence = rural, Indonesia, 1994 IDHS | 232 |
| Table A.5.32 | Life table for infant survival for source of drinking water = others and place of residence = rural, Indonesia, 1994 IDHS | 232 |
| Table A.5.33 | Life table for infant survival for type of toilet facilities = private with septic tank and place of residence = urban, Indonesia, 1994 IDHS | 233 |
| Table A.5.34 | Life table for infant survival for type of toilet facilities = private without septic tank and place of residence = urban, Indonesia, 1994 IDHS | 233 |

| | | |
|---|---|---|
| Table A.5.35 | Life table for infant survival for type of toilet facilities = shared/public and place of residence = urban, Indonesia, 1994 IDHS | 234 |
| Table A.5.36 | Life table for infant survival for type of toilet facilities = river/stream/pit/bush and place of residence = urban, Indonesia, 1994 IDHS | 234 |
| Table A.5.37 | Life table for infant survival for type of toilet facilities = private with septic tank and place of residence = rural, Indonesia, 1994 IDHS | 235 |
| Table A.5.38 | Life table for infant survival for type of toilet facilities = private without septic tank and place of residence = rural, Indonesia, 1994 IDHS | 235 |
| Table A.5.39 | Life table for infant survival for type of toilet facilities = shared/public and place of residence = rural, Indonesia, 1994 IDHS | 236 |
| Table A.5.40 | Life table for infant survival for type of toilet facilities = river/stream/pit/bush and place of residence = rural, Indonesia, 1994 IDHS | 236 |
| Table A.6.1 | Relative risk of demographic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 237 |
| Table A.6.2 | Relative risk of regional factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 238 |
| Table A.6.3 | Relative risk of socio economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 238 |
| Table A.6.4 | Relative risk of socio-economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 239 |
| Table A.6.5 | Relative risk of housing factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 240 |
| Table A.6.6 | Relative risk of sanitation factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS | 240 |
| Table A.7.1 | Percentage of illiterate population according to province, 1995 Intercensal Survey | 241 |
| Table A.7.2 | Ratio community health center (CHC), hospital, doctor and hospital bed per 1,000,000 population according to province, 1991 | 242 |
| Table A.7.3 | Regional GDP and GDP per capita, 1994 (current prices) | 243 |

# Acronyms and glossary

| | |
|---|---|
| ASEAN | Association of South-East Asian Nations |
| AusAID | Australian Agency for International Development |
| BKKBN | *Badan Koordinasi Keluarga Berencana Nasional* (National Family Planning Coordinating Board) |
| BULOG | *Badan Urusan Logistik* (State Logistics Board) |
| *bupati* | Head of regency |
| *bidan desa* | Village midwives |
| *camat* | Head of district |
| CBS | Central Bureau of Statistics |
| CKS | *Centraal Kantoor voor de Statistiek* (Central office of Statistics) |
| *desa* | Village |
| DHS | Demographic and Health Survey |
| *dukun bayi* | Traditional Birth Attendant (TBA) |
| EA | Enumeration Area (*Wilcah*) |
| EPI | Expanded Program of Immunisation |
| FISKA | Forum Indonesia untuk Swadaya Kependudukan (Indonesian forum for self-supporting population) |
| FMS | Fertility Mortality Survey |
| GBHN | Garis Besar Haluan Negara (Broad guidelines of state policy) |
| GDP | Gross Domestic Product |
| GNP | Gross National Product |
| GOBI-FFF | Growth monitoring, Oral rehydration, Breast-feeding and Immunisation—Female education, Family spacing and Food supplementation |
| GOI | Government of Indonesia |
| GRS | *Gerakan Remaja Sehat* (Health Youth Movement) |
| *gubernur* | Head of province |
| IDHS | Indonesia Demographic and Health Survey |
| IMF | International Monetary Fund |
| IMR | Infant Mortality Rate |
| IPPA | Indonesia Planned Parenthood Association |
| IRD | Institute for Resource Development |
| *kabupaten* | Regency (tier of government below province) |

| | |
|---|---|
| KAP | Knowledge-attitude-practice |
| kecamatan | District (tier of government below *kabupaten* or *kotamadya*) |
| *kelurahan* | Village administrative unit, below the *kecamatan* |
| *kepala desa* | Head of *desa* |
| *kotamadya* | Municipality (tier of government for urban areas, below the province) |
| KTI | *Kawasan Timur Indonesia* (Eastern area of Indonesia) |
| KWI | *Konferensi Wali Gereja Indonesia* (Indonesia Church Conference) |
| *listrik masuk desa* | Village electrification program |
| LPSI | *Lembaga Penelitian Strategi Indonesia* (Indonesian Strategy Institute) |
| *lurah* | Head of *kelurahan* |
| MCEB | Mean children ever born |
| MCH | Maternal Child Health |
| MOH | Ministry of Health |
| MPR | *Majelis Permusyawaratan Rakyat* (People's Consultative Assembly) |
| *Muhammadiyah* | Moderate Muslim organisation |
| MUI | *Majelis Ulama Indonesia* (Muslim Scholar of Indonesia) |
| NFPCB | National Family Planning Coordinating Board (*Badan Koordinasi Keluarga Berencana Nasional*) |
| NFPI | National Family Planning Institute |
| NGOs | Non Government Organisations |
| NICPS | National Indonesia Contraceptive and Prevalence Survey |
| NU | *Nachdatul Ulama* (Traditional Muslim organisation) |
| NUDS | National Urban Development Strategic |
| ORS | oral rehydration salts |
| *Pelita* | *Pembangunan Lima Tahun* (Five-Year Development) |
| *Pelita I* | First Five-Years Development 1969/70-1973/4 |
| *Pelita II* | Second Five-Years Development 1974/5-1978/9 |
| *Pelita III* | Third Five-Years Development 1979/80-1973/4 |
| *Pelita IV* | Fourth Five-Years Development 1984/5-1988/9 |
| *Pelita V* | Fifth Five-Years Development 1989/90-1993/4 |
| PGI | *Persatuan Gereja Indonesia* (Indonesian Church Union) |
| PHC | Primary Health Care |

| | |
|---|---|
| PKK | *Pendidikan Kesejahteraan Keluarga* (Family Welfare Education) |
| PKMD | *Program Kesehatan Masyarakat Desa* (Village Community Health Program) |
| PKMI | *Perkumpulan Kontrasepsi Mantap Indonesia* (Union of contraceptive users in Indonesia) |
| PLMS | Pakistan Labour Force and Migration Survey |
| *Posyandu* | *Pos pelayanan terpadu* (Integrated health services post) |
| PSU | Primary Sampling Unit |
| *Puskesmas* | *Pusat kesehatan masyarakat* (Community health center) |
| *Pustu* | *Puskesmas pembantu* (Community health sub center) |
| RAPBN | *Rencana Anggaran Pendapatan dan Belanja Negara* (National budget plan) |
| SKN | *Sistem Kesehatan Nasional* (National Health system) |
| SUSENAS | *Survey Sosial Ekonomi Nasional* (National Socio-economic Survey) |
| TBA | Traditional Birth Attendant (*dukun bayi*) |
| TFR | Total Fertility Rate |
| UN | United Nations |
| UNDP | United Nations Development Program |
| UNICEF | United Nations Children's Fund |
| UPGK | *Upaya Peningkatan Gizi Keluarga* (Family nutrition project) |
| USAID | United State Agency for International Development |
| *walikota* | Head of *kotamadya* |
| WFS | World Fertility Survey |
| WHO | World Health Organisation |
| *wilcah* | *Wilayah pencacahan* (Enumeration Area) |
| YKB | *Yayasan Kusuma Buana* (Kusuma Buana foundation) |
| ZPG | Zero Population Growth |

# 1

# Introduction

## 1.1 Background

The infant mortality rate is defined in this study as the death of children during infancy (aged 0 to 11 months) per thousand life births at a specific time. The child mortality rate is the death of children (aged 1 to 4 years) per thousand children. Levels of infant and child mortality are often used as indicators of general socio-economic well being. Infant and child mortality rates are also sensitive indicators of maternal and child health, as well as of the nutritional and health status of the whole community (Ruzicka and Kane, 1990; Central Bureau of Statistics [CBS], 1995c). Findings from studies of mortality have suggested that reduction in infant and child mortality is highly correlated with improvements in the socio-economic characteristics of the population, as well as environmental characteristics of the community (Orubuloye and Caldwell, 1975). Demographic factors such as maternal age, birth order, sex of the child and birth spacing also have an important effect on infant and child mortality (Hobcraft et al., 1985).

In developed countries where economies and medical services are more advanced, infant mortality rates are much lower than those of the developing countries (United Nations Children's Fund [UNICEF], 1996). Causes of infant deaths vary with the levels of mortality; where infant mortality is high the predominant causes of death are infectious and parasitic diseases, reflecting the environmental health conditions in that community.

Many studies have investigated the levels, trends and determinants of infant and child mortality in Indonesia. Researchers mostly employed indirect methods based on census and intercensal survey data (e.g McNicoll and Mamas, 1973; McDonald et al. 1976; Sinquefield and Kartoyo, 1977; Kabir, 1978; Hull and Sunaryo, 1978; Hull and Rohde, 1980; Utomo, 1982; Kasto, 1983, 1992; Soemantri 1983,1987; Adioetomo, 1985; Adioetomo and Dasvarma, 1986). Due to the unreliability of vital registration data, direct estimation of infant and child mortality using these data was not possible. The direct method for estimating infant and child mortality is possible only if birth history data are collected. National surveys which have collected retrospective birth history data include the 1973 Fertility Mortality Survey (FMS), the 1976 World Fertility Survey (WFS), the 1987 National Contraceptive and Prevalence Surveys (NICPS), and the 1991 and 1994 Indonesia Demographic and Health Surveys (IDHS). Logistic regression is a statistical method commonly used for estimating the social and economic determinants of infant and child mortality in Indonesia (eg. Hull and Gubhaju, 1986; Frankenberg, 1992).

However, it is not only the data that are important in the study of mortality determinants, but also the statistical method that is employed in the analysis. Using wrong or inappropriate statistical models can distort the results of the study. To explain the relationship between mortality and socio-economic variables, it is appropriate to use a statistical method that measures the effect of all mortality determinants including information on age at death. One statistical method that possesses the aforementioned properties is the proportional hazards model developed by Cox (Cox, 1972), and widely applied in demography. The model assumes that risk factors affect the baseline hazard in a multiplicative manner.

This study traces the possible links between cultural, socio-economic and proximate determinants, and infant and child mortality in Indonesia. This is done by applying life table survival functions and Cox regression analysis based on the 1991 and 1994 Indonesia Demographic and Health Survey (IDHS). As will be demonstrated in this thesis, the results will provide an insight into which social and economic factors are important in shaping infant and child mortality levels in

Indonesia. This will be useful for determining appropriate statistical models and making operational plans for reducing infant and child mortality. It can also provide baseline information for further detailed study on the mechanism through which complex sets of variables operate to affect infant and child mortality.

## 1.2 The research problems

Mortality levels in many developing countries have declined considerably during the last three decades. This decline has resulted from developments in many sectors, especially the widespread use of modern medicine and medical technologies (UN, 1984). The mortality levels of these countries, however, are still much higher than those of developed countries.

In Indonesia, the trend of mortality decline has not been as rapid as observed in some neighbouring countries, such as Malaysia, the Philippines and Thailand. The infant mortality rate of 124 per thousand live births in the period 1960-65 declined to 114 per thousand live births during 1970-75. The infant mortality rate further declined to 84 per thousand live births in the period 1985-90 (CBS, 1988: 13).

The Government of Indonesia considers high mortality rates, especially of infants, to be among its most serious population problems. The Government is committed to attaining a high level of health for all its people. Indonesian state policy guidelines (*Garis Besar Haluan Negara* [*GBHN*]) aim at the reduction of the death rate, particularly with respect to infants and children (Government of Indonesia [GOI], 1993). The Indonesian Department of Health aims to achieve infant and child mortality rates of 26 and 40 per thousand live births respectively, and a life expectancy of 70.6 years by the end of the second long term development (year 2019) (Ministry of Health [MOH], 1994b: 22).

Thus, it is important that trends in infant and child mortality are measured precisely using techniques of measurement which minimise errors related to truncation.

## 1.3 Objective of the thesis

The aim of this thesis is to undertake a comprehensive and systematic analysis of infant and child mortality applying life table analysis and the Cox regression method using the 1991 and 1994 Indonesian Demographic and Health Surveys. In addition, based on the 1980 and 1990 Censuses and the 1985 and 1995 Intercensal Surveys, indirect methods are applied in order to estimate the trends and levels of infant mortality at national levels.

The survival functions of children during infancy are estimated at several levels (national, group of island and provincial levels). At the level of group of islands, provinces of Indonesia are grouped into five according to their geographical location.

**Sumatra** consists of eight provinces: Aceh, North Sumatra, West Sumatra, Riau, South Sumatra, Bengkulu, Jambi and Lampung;

**Java-Bali** consists of six provinces: DKI Jakarta, West Java, Central Java, Yogyakarta, East Java and Bali;

**Kalimantan** consists of four provinces: West Kalimantan, South Kalimantan, East Kalimantan and Central Kalimantan;

**Sulawesi** consists of four provinces: North Sulawesi, Southeast Sulawesi, Central Sulawesi and South Sulawesi;

**Eastern** Indonesia consists of five provinces: West Nusa Tenggara, East Nusa Tenggara, East Timor, Maluku and Irian Jaya.

The specific objectives of this study are:

(1) To assess the probability of survival functions of children during infancy and to examine the variation between the groups of five islands and provinces.

(2) To assess the recent levels of infant and child mortality in Indonesia

(3) To study the variations in infant and child mortality according to the socio-economic characteristics of the mother and the household.

(4) To examine the impact of maternal age, parity, survival of previous child, birth interval and sex of the child on infant and child mortality.

(5) To analyse the influence of environmental factors: housing quality, material of the floor, source of drinking water and access to toilet on infant and child mortality.

(6) To analyse the effect of healthcare related to the pregnancy of the mother and to child birth on infant mortality

(7) To examines the variation of the major socio-demographic factors on infant mortality at the provincial level.

## 1.4 Importance of the study

Although extensive studies of infant and child mortality have been conducted in Indonesia, the estimated level and trends of infant and child mortality are based only upon indirect estimates due to the limited data that are available from the censuses and intercensal surveys. Determinants of infant and child mortality based on WFS, NICPS and IDHS data have been estimated by means of logistic regression. However this excluded the most recent infant and child mortality data.

Estimating infant and child mortality by employing the life tables survival functions and Cox's proportional hazard regression analysis has advantages. Prime among them is the possibility of linking survival data with information on health and the use of health care services. More recent data allow a better link between infant and child mortality and socio-economic variables. Finally, inferences drawn from such analysis are more relevant to current policy, by virtue of the more recent reference period. The results from this study can help the government and the policy makers to link current socio-economic conditions of the peoples to community services. Hopefully, government decisions will be unbiased as a result.

The association between covariates and infant and child mortality is particularly relevant to policy and scientific discussion, and it also contributes to the scientific literature on infant and child mortality.

## 1.5 Review of the literature

### *1.5.1 Demographic differentials in infant and child mortality*

The following discussion addresses some of the demographic factors which affect infant and childhood mortality. Demographic factors such as birth cohort, age of mother at the time of child birth, birth order, sex of the child, birth interval and the survival of the preceding child may to some extent be influenced by cultural and socio-economic conditions. For instance, infant mortality has been found by researchers to vary with birth order. The first born and the highest order births have the greater mortality risk, but size of family is determined by socio-economic conditions, and generally the larger families are found among the lower socio-economic classes.

<u>*Maternal age*</u>

Early marriage is associated with early age at childbearing, which is likely to be accompanied by physical immaturity, inexperience in child care, and low socio-economic and educational status among very young mothers (Utomo and Iskandar, 1986: 4; Majumder, 1989; UN, 1987). Biologically, mothers below 20 years of age have a higher risk of losing an infant because they are more likely to have low-birth-weight babies (Streatfield and Bost, 1990: 1). The higher risk of infant death among births of very old mothers is related to the physical weakness, undernourishment and anaemia of the mothers (Ruzicka and Kane, 1987: 85). Kadarusman (1982: 63) and Adioetomo (1985: 12) using 1980 census data found that in Indonesia the highest mortality was among children born to women aged less than 20 years; an infant mortality rate of 133 per 1,000 live births. Majumder also found that in Bangladesh children of teenage mothers (less than 20 years) had about twice the risk of dying during infancy than the children of mothers aged 20-29 (Majumder, 1989: 90).

The World Fertility Survey (WFS) data show that, in most countries, the highest infant mortality is among children born to women aged less than twenty years. The probability of infant death is lowest in the age group 20-29. Thereafter it rises as the mother becomes older. Overall, a U-shaped relationship with age of mother is strongly evident for infant mortality but less prominent for toddler[1] and child mortality (Rutstein, 1984a: 30-31).

Irfan (1986) also shows that the risk of infant death is higher for younger and older aged mothers than those in the middle age groups. For example, according to the Pakistan Labour Force and Migration Survey (PLMS) 1979-80, the infant mortality rate for mothers aged less than 20 years was 154 per thousand live births, and 175 per thousand live births for mothers aged 40 years or more. However, the infant mortality rate was 110 and 130 per thousand live births for mothers aged 20-29 years and 30-39 years respectively (Irfan, 1986: 21). Ewbank et al. (1986: 42) and Gubhaju (1984: 112) also observed a U-shaped relationship between infant mortality and age of mother at child birth in Kenya, Nepal and Indonesia respectively. However, Martin et al. (1983: 429) found that in multivariate and univariate models for Indonesia and Pakistan, children born to women age 35 years and older faced a lower risk than children born to women in the other two age groups (15-24 years and 25-34 years).

*Sex of the child*

In many societies, mortality among infants differs markedly according to the sex of the child. It is commonly observed that males have a higher risk of mortality than females. In Indonesia, infant and childhood mortality in 1980 was 28 per cent higher among males than among females (CBS, 1988: 8). According to WFS data, all countries had a higher male infant mortality rate with the exception of Jordan and Syria which had considerably higher female infant mortality rates. Combined male infant mortality in all countries was 16 per cent higher than the combined female infant mortality (Rutstein, 1984a: 20). These patterns are not apparent in toddler and child mortality. Only about half of the WFS countries had a higher mortality rate for male toddlers and only one-third had a higher male child mortality (Rutstein, 1984a: 20).

---

[1] Toddler is children aged 2-3 years

Heligman (1983) in his study of 22 less developed countries found that the average sex ratio mortality for infants was 1.182, and for children it was 0.978.

These sex differentials in mortality are due to biological selectivity and also sex preference, which is influenced by socio-cultural factors. Males suffer from some biological disadvantages during the first year of life. In the neonatal period of the first month after birth, male mortality will generally be higher than that of females in the absence of sex-selective infanticide. This is possibly because females have two 'x' chromosomes in their genes while males have only one (Waldron, 1983: 141). Vital differences between the treatment of the sexes are most likely to occur after weaning when the baby has to compete for food with the rest of the family.

In countries where female life expectancy is less than males, females don't get as much as attention as males as a result of lower female life expectancy. D'Souza and Chen (1979: 17) observed that in Matlab, Bangladesh during 1974-75, the neonatal mortality rate of 78 per 1,000 live births for males exceeded that for females, 68 per 1,000 live births. This supports other findings that illustrate the inherent weakness of new-born male babies. However, post-neonatal mortality rates from the second to the eleventh month of life, when the care provided by the child's parents plays a much greater role, showed that 64 females babies die for every 53 males. In Bangladesh, the male child enjoys a considerable advantage in terms of parental care, feeding patterns, food distribution within the family, and treatment of illnesses. These appear to be the causes of the higher female child mortality rate (D'Souza and Chen, 1979: 18).

Majumder (1989: 79) also observed that the preference for sons is a long-standing tradition in most of the South Asian countries, accounting for the higher female child mortality rates at age 1-4 years. This even occured at ages 5-14 in South Asian countries such as India, Pakistan and Sri Lanka (El-Badry, 1969: 12).

*Birth order*

Birth order is observed to have an important impact on infant and childhood mortality. The WFS data show that the relationship between mortality and birth order is far from uniform; only 25 of the 41 countries show higher first order infant mortality than second and third born children, and 27 show higher mortality for fourth to sixth order children. However, only four countries (Bangladesh, Haiti, Pakistan and Sudan) have lower infant mortality for the seventh or higher order children. This pattern might be due to the omission of dead children, especially the first-born children (Rutstein, 1984a: 32). Kadarusman (1982: 67) observed that, in East Java and Bali between 1961 and 1973, the rate of infant deaths was higher for first births at 108 per 1,000 live births. The mortality risk then decreased to the lowest level (93 per 1,000 live births) for fourth order births and then increased again to reach 120 per 1,000 live births at birth order eight and over. However, Martin et al. (1983) and Hull and Gubhaju (1986) found that in Indonesia the gross effect of birth order is insignificant although the net effect is significant when maternal age variable is introduced. Majumder (1989: 77) observed that according to the Bangladesh Fertility Survey data, the lowest mortality risk during the neonatal period was among the fourth to sixth birth order infants.

The first-born child is more likely to be born to young mothers who are unprepared biologically, mentally and economically to bear and bring up children. On the other hand, children of high birth order are more likely to be born to older women who are physically more worn out (Hull and Gubhaju, 1986: 115; Martin et al., 1983: 429; UN, 1987 cited in Okojie, 1993: 246).

*Birth interval*

Birth intervals also play a significant role in influencing the risk of infant and childhood mortality (Hull and Gubhaju, 1986: 2; Ewbank et al., 1986: 54; Hartanto, 1991; Muhuri and Menken, 1997). A short birth interval may influence the mother's and the child's health and reduce the chance of the child to survive. Several hypotheses have been formulated to explain the excessive mortality rate for children with a sibling less than two years old. The first and most often mentioned argument points to mother's depletion: rapid successive conceptions do not allow the mother's body to recuperate, therefore possibly affecting the infant's health. Secondly, a short birth interval will be more likely when the births is premature, thereby confounding the effect. Miller and colleagues (1991), however, found that this indirect effect was quite small in Bangladesh, and nearly absent in the Philippines. Thirdly, limited family resources may become especially constraining when there is competition between children of similar ages in the household. Olsen and Wolpin (1983) found a higher mortality rate in Malaysia for children in households in which one or more children competed for resources, and Simmons and colleagues (1982) found the same in India, at least where the reference child was a girl and the older sibling a boy.

Ruzicka and Kane (1987: 23) stated that, if there is a very short interval (less than one year) between two pregnancies, one reason is that the second birth is more likely to be premature. A short interval between births does not give the mother sufficient time to restore her health and may reduce the mother's attention in taking care of the babies. She may have to wean the older child in order to breastfeed the younger baby. Also, younger women generally have shorter birth intervals than older women because the older women are less fecund than the young women.

Rutstein (1984a: 93) defined the birth interval as *short* if under 24 months, *normal* if between 24 and 47 months and *long* if 48 months or more. Data from the World Fertility Survey showed that in developing countries, infant, toddler and child mortality were higher for short birth intervals than for normal intervals and that mortality further declined among those born after long intervals.

Majumder (1989) pointed out that an infant born within one-and-a-half years of the preceding child had a considerably higher risk of dying. Infants born between one-and-a-half and three years after the preceding birth and also those born more than three years after the preceding birth had a considerably lower risk of dying compared to the average mortality risk of all the infants. He estimated that an infant born within 18 months of its preceding sibling had a 3.5 times higher risk of dying than an infant born with an interval between 18 and 36 months (Majumder, 1989: 82). Furthermore, even though when other factors are taken into account, children who had a preceding interval greater than 36 months were about three times less likely to die during the neonatal and infancy period than those whose preceding interval was less than 19 months (Hartanto, 1991).

The results of the 1976 Indonesian Fertility Survey and 1978 Kenya Fertility Survey indicate large differences in infant and child mortality between birth interval groups (Ewbank et al., 1986: 54). The children who were born after long birth intervals had almost twice as high a chance of survival than those born within a short interval. The lower chance of child survival at a short birth interval is also associated with the socio-economic status of the mother or family and it is influenced by the nutritional status of the mother during pregnancy. The infants with short birth intervals would be likely to weigh less, on average, than infants born after normal or long birth intervals (Streatfield and Bost, 1990:1).

*Multiple birth*

Generally, children from multiple births such as twins and triplets have a much smaller chance of surviving than children born singly. Infant mortality rates for multiple births are three to six times higher than rates for single births. This is due to lower birth weight and the high probability of complications during delivery. Multiple births (twins and triplets) are rare events representing only 2.0 per cent of the children in the 41 WFS countries (Rutstein, 1984a: 35). Based on the 1976 Indonesia Fertility and Mortality Survey, the incidence of multiple births was 0.5 per cent (Dasvarma and Hull, 1984: 41). Therefore, the death of these children does not have a great impact on overall mortality. All of the countries in the WFS had infant mortality rates for the children of multiple births of more than 140 per 1,000, and only in seven countries was it below 200 per 1,000. However, only two countries in the WFS data had infant mortality rates for children of single birth of more than 140 per 1,000 live births, and in almost 75 per cent of the countries it was below 100 per 1,000 live births. (Rutstein, 1984a: 36).

### *1.5.2 Socio-economic determinants of infant and child mortality*

In the case of infant and childhood mortality, characteristics of the family and/or the parents play an important role. Parental characteristics such as education, housing conditions, urban and rural residence, and social status in the community influence the survival probabilities and health status of household members. Sometimes the impact of these factors when considered independently is indistinct, because they are interrelated. Income, for instance, in many cases is determined by the level of the social and economic status of households (Hobcraft et al., 1984: 363; Meegama, 1980: 7; Supraptilah and Suradji, 1979: 15)

<u>*Parental education*</u>

Education of both mother and father has been identified as being strongly associated with child mortality in several studies (Martin et al., 1983; Hull and Gubhaju, 1986; Caldwell, 1986; Majumder and Islam, 1993). Rutstein (1984b) found that in 41 countries there was a strong association between infant and child mortality and female education. Further in-depth country studies confirmed that even a year of schooling reduces child mortality. Furthermore, a large body of evidence shows a strong statistical association between maternal education and child survival: a reduction of 7-9 per cent in child mortality with each incremental year of maternal education is found using Demographic and Health Survey (DHS) data (Bicego and Boerma, 1991). Caldwell argues for general change whereby education leads to greater westernisation and modernisation and therefore greater *openness* to new technologies (Caldwell, 1979, 1986). He posited that increased maternal education gives women the power and the motivation to make critical decisions pertaining to their children's health. He argued that there are three factors which are important in the relationship between maternal education and child survival: 1) reduction of fatalism, 2) increased awareness of where to seek health services/medicine/attention, 3) altered intra-household power relationships in a way more directly beneficial to children (Caldwell, 1979).

An economic analysis of the same evidence argues that though the relationship between maternal education and nutritional status and child mortality are unequivocal, it is harder to measure their magnitude and to estimate the true effect of education, which tends to be associated with better income conditions, access to health care and therefore to improved health (Tekce and Shorter, 1984). Indeed, until recently education was regarded merely as one of the indices of socio-economic status and the finding of a strong inverse relationship between education and childhood mortality was given an economic interpretation (Cleland and Van Ginneken, 1989: 1359; Hull and Gubhaju, 1986: 116).

Some studies show that education enhances a woman's knowledge of modern health care providers (Caldwell, 1979; Schultz, 1984). Other studies also show that maternal schooling reflects a higher standard of living and access to financial and other resources. For example, more highly educated women usually marry more educated and wealthier men (Schultz, 1984; Ware, 1984). It has been shown that educated mothers are more likely to take advantage of modern health facilities and comply with recommended treatments (Barrera, 1990; Caldwell, 1979, 1990).

Some studies have suggested that in developing countries child mortality is associated more closely with maternal education than with any other socio-economic factor (Caldwell, 1979, and Cochrane et al., 1980 cited in UN, 1985: 57). The education of the mother has a stronger effect than a father's education in reducing the mortality rate of children. This is probably because the mother is more directly involved in childcare than the father (Arriaga and Hobbs, 1982: 8; Martin et al., 1983: 421; Mitra, 1979: 66; Caldwell, 1979: 398 and Majumder and Islam 1993: 313). In Indonesia, for example, the mother is considered responsible for taking care of the children, and the father goes out to work and pays less attention to household matters (Utomo and Iskandar, 1986: 7). The educational level of the mother influences her level of understanding of health care, hygiene, the need for antenatal and post-natal care, and the awareness of the health condition of her children and the whole family. Caldwell and McDonald (1981: 79-80) point out that

> the fact of schooling was more important than the content of schooling in that both recipient and others saw her as changed, as plugged into a different global culture and removed from many of the constraints of traditional culture. It is assumed by society that an illiterate woman remains part of the traditional culture, accepting its theories of illness and its attitudes to cure and locus of responsibility in initiating treatment as part of a broader social system that allocates responsibilities by age, sex, marital status and relationship.

Caldwell (1979: 399), in an examination of Nigerian data, showed that the educational attainment of mothers is an important factor affecting the variation in infant and childhood mortality. He also suggested that education of women may indicate a mother's social status or it may act independently. Women with higher education are employed mostly in professional and other white-collar occupations. Further studies should be conducted to investigate the relationship between women's education, participation in the labor force and infant mortality. In Indonesia, studies based on the 1971 Census and 1973 Indonesia Fertility and Mortality Survey showed that infant and childhood mortality varied inversely with the level of schooling achieved by the mother in both urban and rural areas (Cho et al., 1976: 65-67; Supraptilah and Suradji, 1979: 69-79).

However, Sullivan and Wilson (1982: 80) found from their study in East Java that the effect of maternal education on the infant mortality rate is only significant for those with primary education to grade five. The mothers who are educated up to grade three are not significantly different from those with no education. On the other hand, Budiarto and Sunaryo (1985: 66) showed that, in West Java, the infant mortality rate differed substantially according to maternal education. The infant mortality rate of uneducated mothers was almost three times higher than that of educated mothers, 120 per 1,000 live births for uneducated mothers, and 47 per 1,000 live births for mothers who had completed senior high school. Other authors such as Utomo and Hadmadji

(1983: 73) and Adioetomo (1985: 17) also find a similar pattern in their studies in Java.

Similarly, the relation between infant mortality and education of father or head of household reflects a negative association. Data from ten WFS countries has shown that paternal education has an effect on mortality in the first two years of a child's life (Hull and Gubhaju, 1986: 4; Ruzicka and Kane, 1987: 91). A few studies from Asian societies show no impact of mother's education on mortality during the period of infancy (Kadarusman, 1982: 91). This evidence has been suggested as being associated with the protection given by prolonged breast feeding among women in societies with a low general level of education for women (Hobcraft and McDonald, 1984: 220).

*Household income*

A higher level of income is expected to be associated with a higher expenditure on food, shelter and sanitation, and this can have a positive influence on survival of household members. The linkage between household income and infant mortality rate and household income is difficult to assess because of the differences between data sets. Current income indicates a family's capacity to purchase health through market inputs such as food, medical services, and household amenities. Household income is likely to correlate with a mother's and child's nutritional intake and use of medical care. Tekce and Shorter (1984) observed the positive influence of household income on the survival probabilities of infants. A case study in Amman, Jordan in 1979 showed that the infant mortality rate for households with income below the median was higher than for those with income above the median, at 92 and 77 per 1,000 live births respectively (Tekce and Shorter, 1984: 264).

*Housing conditions*

Housing conditions can be considered a proxy measure of household income due to difficulty in assessing household income. The availability of electricity, the type of water supply, and lavatory facilities reflect healthy household conditions. Healthy household conditions will lead to lower infant and child mortality rates through reducing the incidence of infectious and respiratory diseases. One of the characteristics of a healthy household is appropriateness of the size of the house, measured by area of floor space. Despite there being no exact figures on how large an area is appropriate for each occupant in a household, this characteristic can be argued to be an important factor influencing infant and child mortality.

D'Souza and Bhuiya (1982: 754) found that, in Matlab, Bangladesh the level of child mortality for households which have areas less than 109 square feet is almost twice that for households which occupy more than 243 square feet. Furthermore, Subekti and Suardi (1984: 18) found that in West Nusa Tenggara households which have an area of less than 15 square meters, the average infant death rate was 306 per thousand while in households occupying about 100 square meters, the average was 124 per thousand.

*Place of residence*

One of the most common distinctions made in demographic studies is between the urban and rural areas of a country, and as already noted with reference to infant mortality, urban areas usually experience lower mortality than rural areas (Hull, 1984: 3). A number of reasons have been proposed to explain urban-rural differentials. It has been noted that infant mortality is generally high where fertility is high, and since fertility tends to be lower in urban than in rural areas, infant mortality could also be expected to be lower in these areas (UN, 1982: 136).

However, increasing concern has recently been placed upon the environment in which children live. For example, source of drinking water, toilet facilities and electricity in the household are related to the social or economic condition of individual families and also the prevalence of various types of childhood disease or sickness. Recently, many demographic surveys in developing countries have been designed to collect information on these household environmental conditions.

Irrespective of the socio-economic condition of the family, better household sanitation and electricity are associated with lowered childhood mortality in the Philippines (Martin et al., 1983). In addition, water and sanitation are assumed to be better in towns than in the countryside. Infant and child mortality is lower when there is clean drinking water and proper sanitation (Streatfield and Korzy, 1987: 1). In Egypt, the provision of piped water to the dwelling was associated with higher survival probability during early childhood (Casterline et al., 1989).

The existence of a toilet facility in the household has emerged as a significant determinant of early age mortality in Sri Lanka, even when the effects of a number of social and demographic factors were controlled (Trussell and Hammerslough, 1983: 12; Meegama, 1980: 9). Toilet facility as well as source of drinking water appeared to be important determinants of infant mortality in urban Nepal (Gubhaju, Streatfield and Majumder, 1991). However, Sloan and Haines & Avery (cited in Tekce and Shorter, 1984: 85) found that in Mexico, Puerto Rico and Costa Rica, sanitation variables had very little impact on infant mortality, and they concluded that there was little evidence of a causal relationship. According to Majumder and Islam (1993), the place of residence had no affect on child survival in spite of the high concentration of medical facilities in urban areas (Majumder and Islam 1993: 317). In rural Bangladesh, D'Souza and Bhuiya (1982) observed that the mortality rate at ages 1-4 years in households with inadequate latrines was 35 per cent higher than in the households possessing such facilities. However, no control for the influence of other social or economic conditions was used in the study.

Generally public health measures are more fully developed and implemented in urban areas. Since place of residence is often associated with education, occupation or income, the observed rural-urban mortality differences could reflect merely the differences in these socio-economic factors (Jain, 1985: 411). However, WFS data suggest that in many developing countries the differentials are substantial even after controlling the influences of a number of socio-economic factors (Hobcraft et al., 1984: 225). Mortality tends to be relatively low in urbanised areas where health facilities are located and which are accessible to the population because of modern transport and communication (Ewbank et al., 1986: 52).

Using WFS data, Ewbank et al. (1986: 52) and UN (1985: 117), showed that child mortality rates, between ages one and five years, tended to be lower in urban areas. From UN analyses, it can be seen that mothers who live in rural areas have a higher risk of infant and child mortality. For all developing countries, except Kenya, child mortality was higher for mothers with rural backgrounds than for those from urban areas.

## 1.6 Analytical framework

The associations between the factors (bio-demographic, socio-cultural and economic, etc) that affect infant and child mortality are very complex. Consequently, it is necessary to develop an analytical framework in order to identify causal linkages and to understand the relationships between determinants that influence infant and child mortality. Various conceptual frameworks have been proposed and developed for the study of child survival in developing countries. However, there is no general theory covering mortality during childhood and the mechanisms through which various determinants operate to influence child survival (Behm, 1991: 9).

The analytical framework used in this study is derived from several conceptual frameworks of determinants of child survival. These frameworks were developed by Mosley and Chen (1984), Mosley (1985), Jain (1985), Mahadevan (1986), Norren and Vianen (1986) and Shah and Shah (1990). The framework used takes in account the limitations of the 1991 and 1994 IDHS.

Mosley and Chen's (1984) conceptual framework is widely adopted by researchers studying child survival. This model assumes that health-related practices at the household level affect the survival of children under-five years old. Mosley and Chen use a set of intermediate variables which directly influence the risk of morbidity and mortality. They group 14 intermediate variables into five categories: maternal factors, environmental contamination, nutrient deficiency, injury and personal illness control. All social and economic determinants must operate through these variables to affect child survival. Mosley (1985) proposed a variation to this analytical framework: the most important change being the inclusion of political and institutional factors such as a health program.

However, Jain (1985) argued that it is unnecessary to include all intermediate variables in the analysis, because the determinants of child mortality depend on the *age* of the child. According to Jain (1985), there are three different levels that affect infant mortality: community, household and individual. They are arranged in ascending order according to their proximity to the dependent variables. The individual-level factors are closest to the dependent variable, next come the household-level factors, and the community-level factors are the most distant. He assumed that the chance of infant survival is firstly dependent on the degree of care that the infant receives. Secondly, it is dependent on the physical, and social environment of the household. Thirdly, it is dependent on the social and economic environment at the community or village level.

Mahadevan (1986) and Shah and Shah (1990) introduced other broader theoretical frameworks for determining infant and child mortality. They link the political, social and economic policies, and conditions at national and international levels with household, individual and proximate factors affecting child mortality (Mahadevan, 1986; Shah and Shah, 1990). Norren and Vianen (1986) proposed a new model for the study of the malnutrition-infection syndrome and its demographic outcome (survival or death of children up to age five). Their model is based on fertility studies by Bongaarts and Potter (1983) and the work of Mosley (1985) on health and under five mortality. According to Norren and Vianen (1986), the intermediate variables are both behavioral and biological factors which are classified based on the GOBI-FFF[2] and child survival package program of UNICEF and WHO.

Figure 1 illustrates the broad conceptual model used in this study. It is assumed that the factors affecting infant and child mortality are different depending on the age of the child. In the proposed framework, the first level of the framework refers to the community and household characteristics related to socio-economic and environmental factors. The second level of the framework refers to the demographic characteristics of the mother and index child in the study. The third level refers to the health care that is related to the pregnancy of the mother and birth of the index child. The last level refers to the survival of the child.

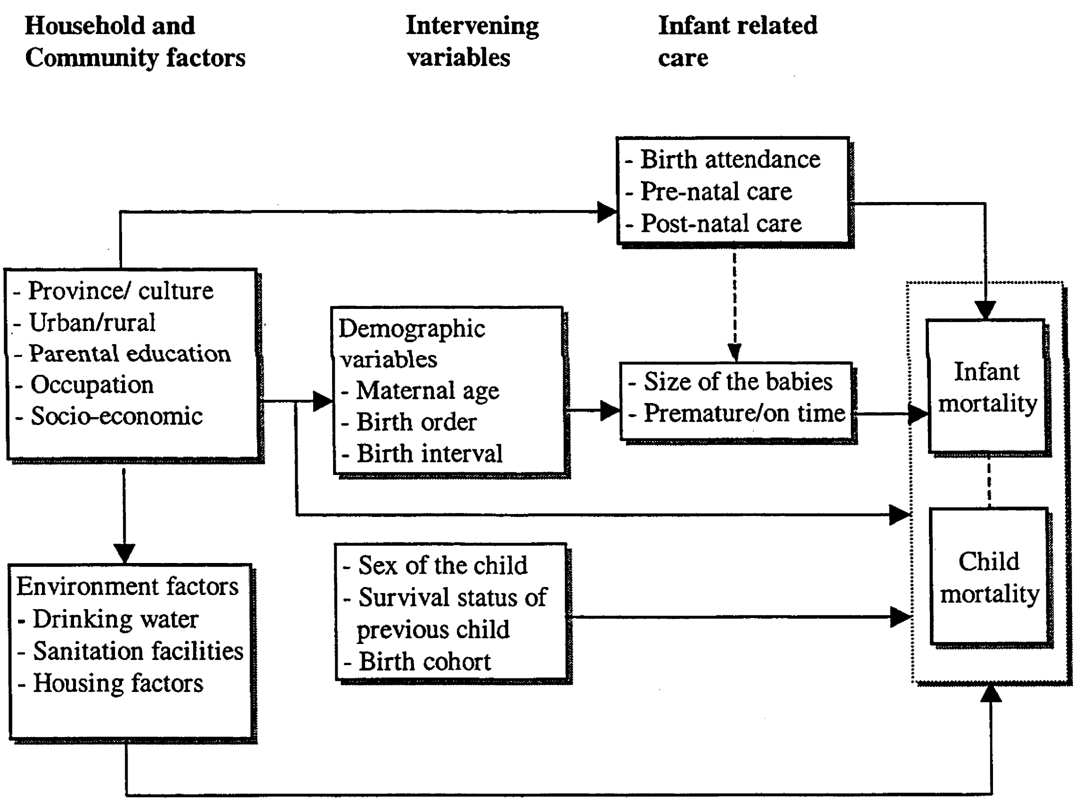
The socio-economic factors, maternal factors and dependent variables in the framework are those used by Mosley and Chen (1984: 27). The assumed directions of the relationships between the determinants of infant and child mortality are shown in Figure 1 by the arrows that connect the boxes. Individual factors, such as the size of the baby and whether the baby was born prematurely and the health care received during the pregnancy are mostly related to infant mortality rather than to child mortality. In addition, other factors influence infant and child mortality. For example, vaccination of the pregnant mother against tetanus can virtually eliminate deaths from neo-natal tetanus. Proper medical care at delivery can also reduce the risk of death from birth injury and/or tetanus. Post-natal care, such as breastfeeding and immunisation, and timely and appropriate medical treatment in the case of illness can reduce the risk of death during infancy. However, the only information available in this study is about the immunisation of living children not dead ones.

The new-born baby's condition is influenced by intervening variables such as demographic factors (age of the mother at child bearing, birth order and length of the preceding birth interval). The demographic factors are affected by variables at the

[2] GOBI-FFF (Growth monitoring, Oral rehydration, Breast-feeding and Immunisation – Female education, Family spacing and Food supplementation) are primary health care strategies recommended by the UNICEF.

community and household level. Maternal age at child bearing, parity and preceding birth interval are related to cultural factors which reflect the place of residence and educational attainment of respondents. Other intervening variables, the sex of the child, survival status of preceding child and birth cohort are considered in the model as control variables. Sex of the child controls for biological effect, survival status of previous births controls for high risk mortality in the household while birth cohort controls for changes of mortality level over time.

Figure 1 Analytical framework for the study of infant and child mortality determinants in Indonesia




The household and community factors reflect the environment in which a child is born and raised. Household factors consist of the environmental and socio-economic condition of the households. Environmental contamination is conditioned by the quality of drinking water, the toilet facilities and the building materials of the house. Socio-economic conditions are determined by parental education, paternal occupation, parent's ability to read letters and newspapers and speak Indonesian and the possession of a stove, television and electricity. The community factors are determined by the availability of infrastructure facilities such as medical services, water supply, school, transport and communication in the provinces. The use of these facilities varies between households in the same village or community. Therefore, the primary effect of these factors on infant and child mortality will be transmitted through changes in household-level factors. Furthermore, the effect of community-level factors will be transmitted to the individual factors if entire households in the community are equally affected. For instance, if all pregnant women and children in the community were immunised, or if all of the households in the community were consuming contaminated or clean water from the same source.

## 1.7 Organisation of the study

This study is organised into eight chapters. Chapter Two discusses methodology, data sources and data quality. Information about Indonesia and, in particular, health development is described in Chapter Three. Levels and trends of infant and child mortality are discussed in Chapter Four. Chapter Five deals with the survival function of infant mortality by socio-demographic factors. Chapter Six discusses a multivariate analysis of infant mortality using the Cox regression method. Provincial differentials of infant mortality are discussed in Chapter Seven. Chapter Eight concludes the thesis, makes policy suggestions and offers some suggestions to improve the measurement and analysis of mortality.

## 1.8 Summary

This chapter has highlighted the proximate determinants found by previous researchers. These determinants have a significant effect on infant and child mortality especially in many developing countries. The determinants of infant mortality include not only proximate variables but also more complex factors such as government expenditure in health sectors, government policy, the availability of community health services, health personnel and the culture of the people.

The level of measured infant and child mortality depends on the completeness and the reliability of the data, and also on the methods of estimation and statistical measurement. Chapter Two discusses data sources and the methodology used in this study. The fieldwork of the surveys, sample sizes, coverage of the surveys and quality of the data are discussed and examined in the next chapter. The justification for using the chosen methods of analysis as statistical tools for measuring the significance of the parameters and the functional equations is also discussed in Chapter Two.

# 2

# Data and methodology

## 2.1 Introduction

The development of the conceptual framework for the study of infant and child mortality requires appropriate data that can incorporate all the proximate determinants discussed in Chapter One. Employing the appropriate statistical models for measuring the linkage between determinants that influence infant and child mortality in the proposed analytical framework is very important. This chapter discusses the sampling design, the data collection procedure, the type of data collected and the quality of collected data. In addition, the statistical models and techniques, used in the estimation of infant and child mortality levels, and in the examination of the relationship between infant and child mortality and the various demographic, social, economic and environmental factors, will be described.

## 2.2 Description of the global program of Demographic and Health Surveys

In 1984, the US Agency for International Development (USAID) initiated the Demographic and Health Survey (DHS) program. These surveys are follow-on activities to the World Fertility Surveys and the Contraceptive Prevalence Surveys. The purpose of the DHS program is to assist less developed countries to conduct nationally representative population and health sample surveys. The DHS program aims to provide information for policy and program decision makers, and also for scientific research. Further, the program aims to expand the interactive population and health database, to advance survey methodology, and to develop the technical skills and resources that are necessary to conduct demographic and health surveys.

In its first phase, 1984-89, the DHS assisted 20 countries. During its second phase, 1988-93, the DHS assisted 25 countries. By 1993, the DHS will have conducted more than 50 surveys. The data collected by the DHS covers information on fertility and infant and child mortality levels and trends, use of family planning, attitudes toward family planning, marital status, breast feeding, various material and child health indicators, anthropometry and socio-economic characteristics. The respondents of these surveys are women 15 to 49 years of age. In some countries of Asia and the Near East only married women were interviewed while in others unmarried women were included.

## 2.3 Source of the data

The data used in this study are the 1991 and 1994 Indonesia Demographic and Health Surveys (IDHS). The Central Bureau of Statistics (CBS) conducted these surveys in collaboration with the Institute of Resource Development, Westinghouse Health System, and USAID.

### *2.3.1 Coverage and sample design of the 1991 and 1994 Indonesia Demographic and Health Survey*

The 1991 and 1994 Indonesia and Demographic and Health Surveys (IDHS) were conducted in 27 provinces in Indonesia, as part of phase II and III of the Demographic and Health Survey program. The 1991 IDHS sample was drawn from a five per cent sample of the October 1990 Population Census. The 1994 IDHS sample was a sub sample of the 1994 *Susenas* (National Social Economic Survey) carried out annually by the Central Bureau of Statistics (CBS). *Susenas* produced data on various demographic and socio-economic indicators of the population.

The sample selection for most provinces in the 1991 IDHS employed a two-stage sampling procedure. First, enumeration areas (EAs or *wilcah*) were selected with probability proportional to size within the urban and rural domains of each province. In the second stage, individual households were selected from household listings for each EA. In 16 provinces, 25 households were selected in each EA, and in the other 11 provinces 20 households were selected in each EA. In order to concentrate the sample and reduce the level of effort required during fieldwork, in the six most remote and logistically difficult provinces, East Timor, Irian Jaya, Maluku, East Nusa Tenggara, Central Kalimantan and East Kalimantan, a three-stage procedure was used. First, regencies were selected, and within regencies the EA was selected, and within the EAs households were selected (CBS, 1991, 1992a).

The 1994 IDHS sample was selected in three stages. In the first stage, EAs were selected systematically with probability proportional to population size. In the second stage, one segment within the EAs, consisting of 70 households with a clear boundary, was selected with a probability proportional to size. In the third stage (the IDHS sample), 25 households were selected from each segment using systematic sampling; half of those were then selected for the household expenditure survey which was conducted at the same time (CBS, 1994b, 1995a).

The 1991 IDHS covered a sample of nearly 28,000 households and approximately 23,000 respondents were interviewed. Respondents for the individual interview were ever married women aged 15-49. During the data collection, there were 23,470 eligible women, and of those 22,909 women were successfully interviewed. The individual response rate was 98 per cent (CBS, 1992a). The number of selected areas in each province is presented in Table 2.1.

The 1994 IDHS selected 35,510 households, 34,060 (95 per cent) of them successfully interviewed. In these households 28,800 eligible women were identified and complete interviews were obtained from 28,168 women (97.8 per cent) (CBS, 1995a).

Table 2.1 Sample coverage according to province, 1991 and 1994 Indonesia Demographic and Health Surveys (IDHS)

| Region/Province | 1991 IDHS | | 1994 IDHS | |
|---|---|---|---|---|
| | Household | Eligible women | Household | Eligible women |
| Sumatra | | | | |
| Aceh | 1000 | 732 | 1250 | 1099 |
| North Sumatra | 1511 | 1213 | 1509 | 1197 |
| West Sumatra | 1251 | 1009 | 1251 | 894 |
| Jambi | 508 | 475 | 1003 | 902 |
| Riau | 500 | 497 | 1250 | 1067 |
| South Sumatra | 1250 | 1194 | 1250 | 1059 |
| Bengkulu | 500 | 404 | 1002 | 868 |
| Lampung | 1251 | 1030 | 1251 | 985 |
| Java-Bali | | | | |
| Jakarta | 2038 | 1825 | 2065 | 1809 |
| West Java | 2077 | 1736 | 2104 | 1589 |
| Central Java | 1714 | 1448 | 1861 | 1502 |
| Yogyakarta | 1651 | 1077 | 1658 | 1131 |
| East Java | 1812 | 1519 | 1875 | 1533 |
| Bali | 1325 | 1017 | 1650 | 1281 |
| Kalimantan | | | | |
| West Kalimantan | 999 | 892 | 1251 | 1067 |
| Central Kalimantan | 500 | 435 | 1000 | 871 |
| South Kalimantan | 1006 | 935 | 1255 | 1068 |
| East Kalimantan | 500 | 435 | 1012 | 853 |
| Sulawesi | | | | |
| North Sulawesi | 1000 | 681 | 1250 | 859 |
| Central Sulawesi | 501 | 436 | 1000 | 795 |
| South Sulawesi | 1499 | 1236 | 1501 | 1238 |
| Southeast Sulawesi | 500 | 369 | 1000 | 735 |
| Eastern Indonesia | | | | |
| West Nusa Tenggara | 1250 | 989 | 1254 | 972 |
| East Nusa Tenggara | 501 | 472 | 1006 | 827 |
| East Timor | 499 | 475 | 1001 | 970 |
| Maluku | 500 | 477 | 1000 | 783 |
| Irian Jaya | 498 | 462 | 1001 | 846 |
| Total | 28141 | 23470 | 35510 | 28800 |

Source: CBS, 1992a, 1995a

### *2.3.2 Questionnaire*

The 1991 IDHS utilised two questionnaires and several forms for data collection and for the supervision of the field activity. There were two manuals, one for the interviewers and one for the supervisors. The household questionnaire was used to record all members of the selected households who usually lived in the household. The questionnaire was utilised to identify the eligible respondents in the household, and to provide the numerators for the computation of demographics measurements. The individual questionnaire was used for all ever-married women aged 15-49, and consisted of eight sections,

1. Respondent's Background
2. Reproduction
3. Knowledge and Practice of Family Planning
4. Pregnancy and Breastfeeding
5. Immunisation and Health
6. Marriage
7. Fertility Preferences
8. Husband's Background and Woman's Work.

The reproduction section is the most important section for this study because it provides information regarding the birth history of respondents. The information gathered in this section includes for each child ever born, sex of the child, month and year of birth, survival status of the child, age when the child died, and whether the child lived with the respondent. Using the birth history data collected in this section, it is possible to compute measure of the levels and trends of fertility and mortality, especially infant and child mortality rates.

However, the 1994 IDHS was significantly expanded from the 1991 IDHS to include two new modules in the individual's questionnaire, namely maternal mortality[3] and awareness of AIDS. The survey also included two additional questionnaires about the availability of health and family planning services, and a household expenditure questionnaire. The availability of health and family planning services information can be used for linking women's fertility, family planning and child care with the availability of services.

Both surveys were equipped with a fieldwork control form, which consisted of a Supervisor's Control Sheet and an Interviewers' Control Sheet. Both forms were

[3] This section collected the data regarding to the death of all respondent's sisters related to the pregnancy.

filled in daily to monitor the allocation of work and the results of attempted interviews. One sheet was filled for every sample unit (census block). This information is useful in assessing the response rates and in controlling the flows of documents. In addition, each supervisor completed an Interviewer Progress Sheet for every interviewer in the team in order to monitor the number of interviews completed by team members.

### *2.3.3 Fieldwork*

The main fieldwork of the 1991 IDHS was held during May-August 1991. The data collection was carried out by 56 teams. The 1994 IDHS data collection was started in early July and completed in November 1994 by 86 teams. Each team consisted of two or four interviewers, one field editor and one supervisor. The number of interviewers in a team was dependent on the number of enumeration areas selected in the respective province. Female interviewers were used due to the sensitive nature of questions asked in the survey, and for logistical and security reasons all of the supervisors were male. The teams worked together and stayed in the field until they completed the interviews in each EA, and then moved on to the next EA using public transport. Provincial statistical office and CBS headquarters staff made periodic visits to the field to monitor the work.

The interviewer occupies the central position in the DHS since she is the one who collects information from the respondents. Therefore, the success of the DHS depends on the quality of each interviewer's work.

In general, the responsibilities of an interviewer for the DHS includes:

- locating the structures and households in the sample which are assigned to her by the supervisor of the team;
- identifying all eligible women in households assigned to her and conducting interviews with them;
- checking completed interviews to make sure that all questions were asked and the responses neatly and eligibly recorded;

- returning to the household to interview women she could not contact during her initial visit.

A respondent's answer is the main information that the interviewers will use to fill in the questionnaire. The level of the respondent's memory in recalling the distant past events and the honesty of the respondents in answering the interviewer's questions influences the quality of the data.

The editing of the questionnaire took place in three stages. The first stage was carried out in the field by supervisors and editors and included:

- spot checks to ensure that only eligible households and individuals were being interviewed,
- reinterviews of parts of the questionnaires to assess quality of reporting by the interviewers, and
- consistency checks.

Where necessary, respondents were interviewed again to give missing information judged to be crucial such as dates of events, or to correct obvious inconsistencies. In the second stage, office editing involved the checking of the questionnaires to ensure that key information such as identification, birth history, and date and age, was complete, correct and consistent. Decisions on what to do about errors were usually taken after a case-review.

## 2.4 Limitation and quality of the data

This very limited discussion of the quality of the data will focus on some of the more common problems associated with Indonesian survey data in general and survey data based on the pregnancy history technique specifically.

One such common error for surveys conducted in populations with low educational status is *age heaping* on ages which end in either zero or five. This occurs because most respondents do not know their ages so interviewers have to estimate the ages of the respondents by several indirect methods such as use of historical calendars and comparison with people whose age is known. In this particular survey, interviewers were ask to record how the respondent's age was determined, i.e., whether the respondent declared their age or whether the interviewer estimated the respondent's age. In estimating the ages, the interviewers seemed to prefer rounding off ages to end either in zero or five.

In addition to digital preference, interviewers and respondents often provided wrong estimates of age. This results in a transfer of women into the wrong age groups and a distortion of the expected patterns of children ever born, children dead, and the percentage of deceased children. Normally when there are no such errors, the mean number of children ever-born, deceased children, and the percentage of deceased children should increase with each succeeding age group. This is because the children of older women, on average, have more time and exposure to the risks of mortality resulting in more child deaths for older women. Another error which distorts the expected patterns of children ever born, children dead and the percentage of deceased children is the tendency for older women to under report their total number of deceased children and children ever born.

Extensive analysis of the quality of the WFS data in the Philippines (Reyes, 1981) and Malaysia (Yatim, 1982) reveals that the quality of the birth history data is good, especially for the very recent past. Supraptilah (1982) concludes that the level and timing of recent fertility in Indonesia is relatively accurately reported.

### *2.4.1 Completeness and quality of age reporting*

The age of the child defines the dependent variable and is central to the analysis. The completeness and quality of data on birth date and age of the child are very important in studying infant and child mortality. In developing countries, the reporting of births and ages is *inherently fraught* with uncertainty and imprecision (Boerma et al., 1993). The current age of a child is most precisely defined when the mother in the birth history provides a complete birth date (both month and years). Current age is less precisely ascertained when only the year of birth is reported or when a year of birth and a current age (in year) is given.

The relationship between the precision of birth date reporting and age varies the survival status of the index child. DHS reports show that data on children who are no longer alive are four times less comprehensive than data on living children (Boerma et al., 1993). According to the 1991 IDHS, 14 and 25 per cent of dead children under one year old and under five years respectively had an incomplete birth dates. The birth date information among children born in the five years before the survey for the 1991 IDHS data was eight per cent incomplete. This was the highest among the ASEAN (Association of South East Asian Nations) countries (Bicego and Boerma, 1993).

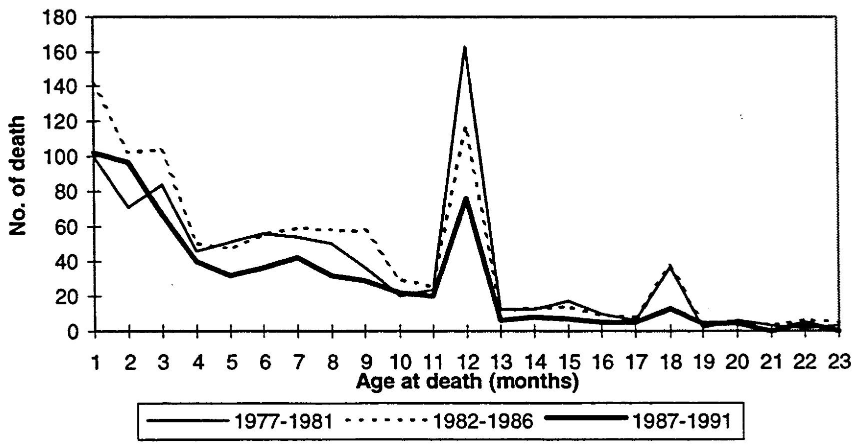
The age of a child in months is important in the analysis of mortality, especially the study of infant mortality. Misreporting the month of birth affects many measures, especially the life table analysis of infant and child mortality (censoring). Becker (1984) provides evidence which suggests that the month of birth of young children may be systematically misreported in birth histories (Becker, 1984).

In developing countries, it is not common for parents to register the birth or the death of their children, especially in rural areas. There is in fact no system in Indonesia for parents to do this. Therefore, respondents usually find it very difficult to estimate their own age or the age of their children; they tend to estimate their age with digits ending in zero or five. However, for the children who have died, respondents tend to report an age which is easy to remember, such as one month, three months, seven months, 12 months and 18 months and so on; usually reporting of age at death is heaped at these ages (Figures 2.1 and 2.2). According to tradition in Indonesia, parents usually celebrate the birth of their babies when they reach seven months.

DHS reports show that considerable heaping occurs at 12 months of age in all surveys, except for Sri Lanka and Thailand (Bicego and Boerma, 1993: 46). Heaping at 12 months poses a dilemma for mortality analysis, since the heap falls at the boundary between two age categories, infant (0-11 months) and child (12-59 months). Infant and child mortality rates are conventionally calculated using these age intervals. These figures warn against the use of 12 months as a cut-off point for the analysis of age-specific determinants of childhood mortality. Furthermore, a cut-off anywhere inside the 12 to 23 month period for most surveys is also unwise since it is clear that most of the deaths in the period are reported at 12 months or one year. Another analysis on the impact of heaping on estimating infant and child mortality suggests that infant mortality may be underestimated by up to eight per cent and child mortality underestimated by up to ten per cent as a result of heaping (Sullivan et al., 1990).

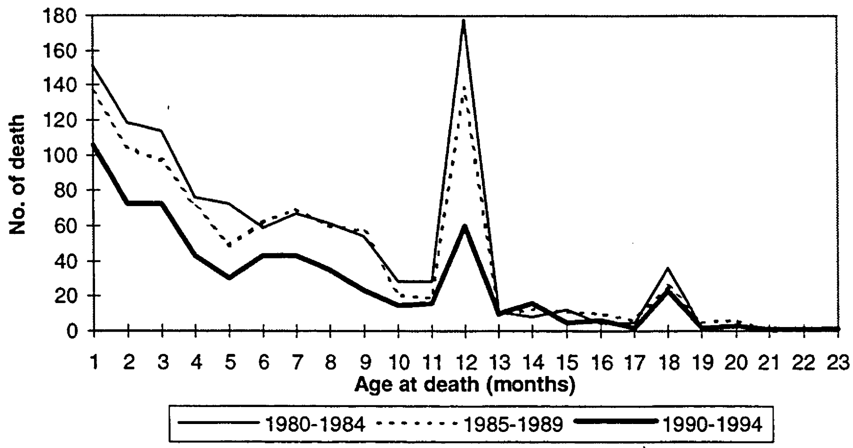
The 1991 and 1994 IDHS data indicate that heaping is more severe for deaths that occurred to cohort farther in the past compared to those that occurred to the more recent cohort (Figures 2.1 and 2.2). To minimise this type of error, interviewers were instructed to record deaths less than one month of age in days, under two years of age in months and two years and over in years. It should be noted that although misreporting of age at child death may result in biased estimates of infant and child mortality, a simulation study using DHS data indicates that the magnitude of misreporting evident in the IDHS would bias the estimates by no more than five per cent (Sullivan et al., 1990).

Figure 2.1 Number of reported deaths among children under two years according to age at death and birth cohort, 1991 IDHS




Source: 1994 IDHS data set

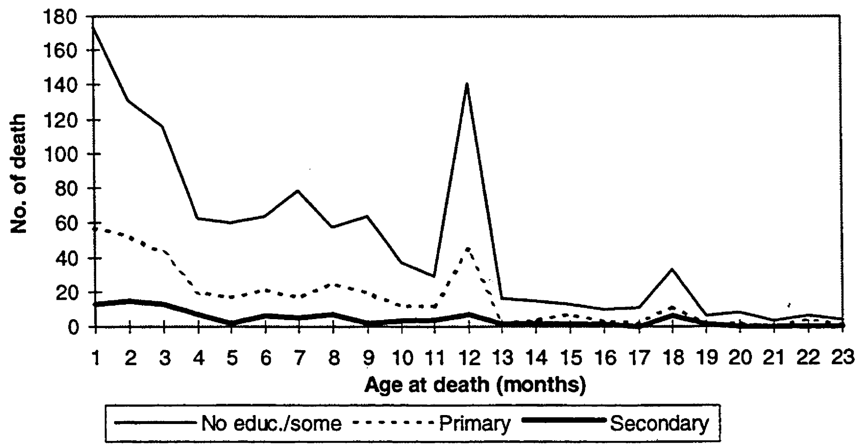
Figure 2.2 Number of reported deaths among children under two years according to age at death and birth cohort, 1994 IDHS




Source: 1994 IDHS data set

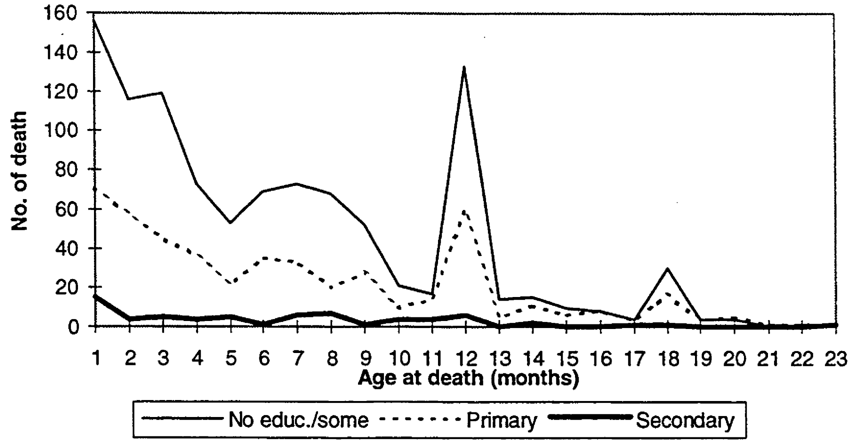
Arnold (1990) provides useful figures on the completeness of birth date reporting in DHS surveys according to several demographic and social variables. Not surprisingly, maternal education is strongly linked with the complete reporting of children's birth dates. However, Figures 2.3 and 2.4 show that heaping occurs at the same ages for all three education groups but that the extent of heaping decreases as education rises. Heaping at seven months for respondents with no education and with primary school education may be because these respondents mostly live in rural areas, and still follow traditional values.

Figure 2.3 Number of reported deaths among children under two years according to age at death and education of mother, 1991 IDHS



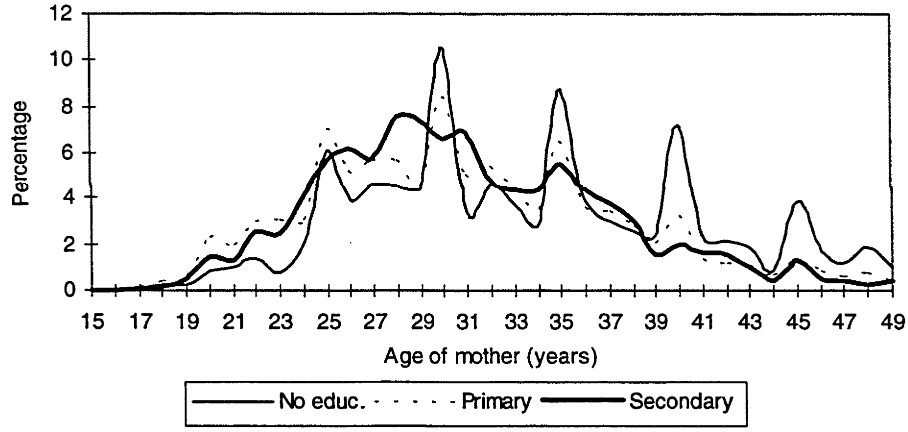

Source: 1991 IDHS data set

Figure 2.4 Number of reported deaths among children under two years according to age at death and education of mother, 1994 IDHS




Source: 1994 IDHS data set

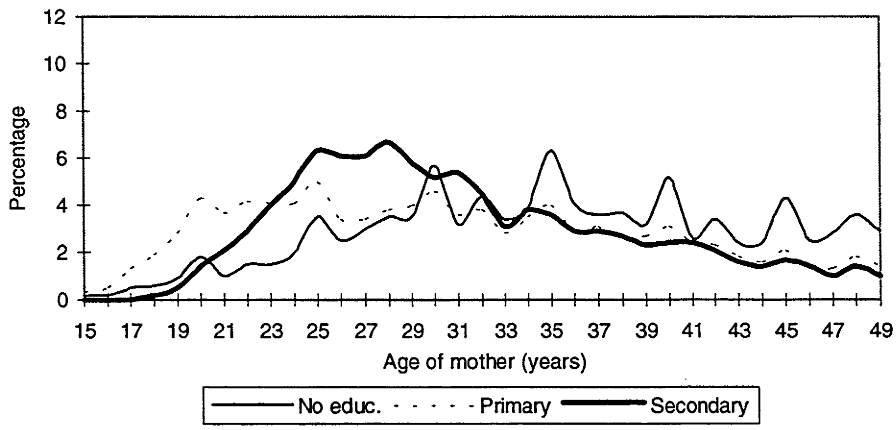
Figure 2.5 Age distribution of ever married women, according to education, 1991 IDHS




Source: 1991 IDHS data set

Figures 2.5 and 2.6 show the comparisons of the respondent's age at the time of birth and their educational attainment (1991 and 1994 IDHS). Education of respondents seems to be an important factor influencing the accuracy of age reporting. Respondents who had attended school usually remembered their own age because their age or their date of births were registered at school. Figure 2.5 shows that respondents who never attended school, and those who had only attended primary school had severe heaping in ages ending in zero and five years. However, for mothers who had secondary education, heaping was only found at ages 26, 31, 35 and 45 years, but not at other ages. Figure 2.6 shows less heaping than Figure 2.5

Figure 2.6 Age distribution of ever married women, according to education, 1994 IDHS

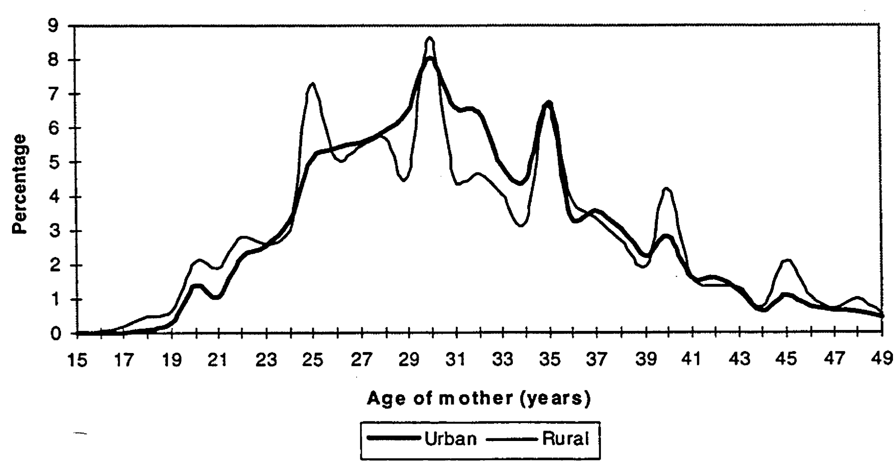



Source: 1994 IDHS data set

especially for respondents with primary education. However for mothers with secondary education, the heaping shows at ages 25, 28 and 31 years.

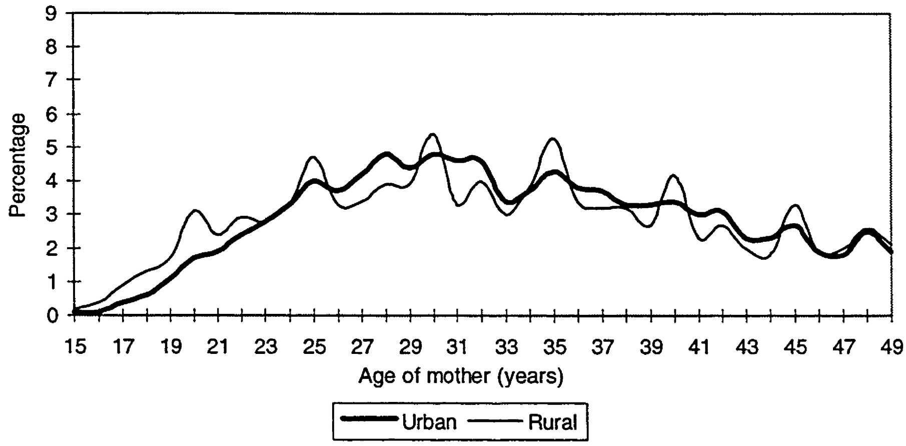
Figures 2.7 and 2.8 show the difference in respondent's age reporting between urban and rural areas in Indonesia. Urban respondents have less heaping in reporting their ages than rural respondents. This is because most urban respondents are more educated and more have proof of date of birth compared with those from rural areas. Respondents from rural areas have heaping at ages ending in zero and five years. However, substantial heaping is only found at ages 30 and 35 years for respondents from urban areas.

Figure 2.7 Age distribution of ever married women, according to place of residence, 1991 IDHS




Source: 1991 IDHS data set

Figure 2.8 Age distribution of ever married women, according to place of residence, 1994 IDHS




Source: 1994 IDHS data set

### *2.4.2 Omission of births and deaths and information relating to births and deaths*

Missing information may occur because the respondent does not know the answer to a question and hence is unable to give a response or because the interviewer makes a mistake such as forgetting to ask the question or forgetting to fill out the answer. Missing information on the date of birth and age at death of children is a particular concern for the estimation of childhood mortality rates.

Date of birth data is essential for any analysis of mortality by time period. Ignoring cases with missing information would cause downward biases in childhood mortality rates because typical information on the year or month of birth is more likely to be missing for children who have died than for children who are still alive (Chidambaram and Sathar, 1984; Sullivan et al., 1990). Trends and differentials in mortality rates would also be distorted because, in general, the date of birth is more likely to be missing for events further back in time and for children in certain sub-groups of the population (Chidambaram and Sathar, 1984).

However, the Institute for Resource Development (IRD) has developed a standard imputation procedure if the year or month of birth is missing. The imputation procedure uses other information reported by the respondent to establish a logical time-period in which the birth probably occured and then randomly assigns a date within that period. Thus, with a well designed imputation program, the impact of missing birth dates is reduced (Institute for Resource Development [IRD], 1987).

Missing information on age at death causes problems because it is not possible to determine the allocation of the death and the exposure in the calculation of mortality rates. This would be very severe if a large number of children who died did not have a recorded age at death. For this purpose, the IRD has developed an "hot deck" imputation procedure. The missing age at death is assigned the value from the last death of a child with the same birth order. If the omission of the age at death is systematically related to the age at death of the child the imputation process would induce some distortion in the age pattern of mortality, although the overall under five mortality rate is likely to be unaffected. However, if omission of age at death is not systematically related to the age at death, the imputation process will have little impact on child mortality rates (IRD, 1987).

For reasons often ascribed to memory lapse, older women are more likely to under-report the number of their children ever born and children dead. In some provinces of Indonesia, it is not comfortable for people to talk about children who have died because no one wants to remember the sad event. This affects the number of children ever born and dead in the birth history information collected in the 1991, and 1994 IDHS surveys, and in other Indonesian data collections.

Singh (1987) noted that to assess the omission of births and deceased children in the data it is important to examine the mean number of children ever born (MCEB) and the proportions of deaths among MCEB by the age group of the mother. The MCEB and proportions of deaths should increase with the increase in the age group of the mother.

Table 2.2 Mean number of children ever born to ever-married women and proportion of deaths according to age of mother, Indonesia

| | 1991 IDHS | | 1994 IDHS | |
|---|---|---|---|---|
| Age of mother | Mean children ever born | Proportion of deaths | Mean children ever born | Proportion of deaths |
| 15-19 | 0.61 | 0.11 | 0.59 | 0.08 |
| 20-24 | 1.34 | 0.09 | 1.26 | 0.08 |
| 25-29 | 2.30 | 0.10 | 2.14 | 0.09 |
| 30-34 | 3.29 | 0.11 | 3.16 | 0.11 |
| 35-39 | 4.14 | 0.12 | 4.03 | 0.11 |
| 40-44 | 4.81 | 0.14 | 4.74 | 0.13 |
| 45-49 | 5.35 | 0.15 | 5.28 | 0.15 |
| Total | 3.24 | 0.12 | 3.21 | 0.11 |

Source: 1991 and 1994 IDHS data sets

Table 2.2 shows that the mean number of children ever born, based on the 1991 and 1994 IDHS data, increases the older is the mother. While this is consistent with the supposition that the 1991 and 1994 IDHS data does not suffer from substantial omission of births, it is not conclusive. For example, a trend towards lower fertility would also tend to produce lower numbers of children ever born at younger ages. Furthermore, the proportion of deaths increases the older is the mother. The exception is for mothers aged 15-19 years whose children are expected to have a high risk of death (1991 IDHS). The rate of child loss to older women is expected to be higher than that of younger women, primarily because older women have older children who have been exposed to the risk of dying for a longer period, but also because mortality has been changing over the years to the advantage of the younger women and their children.

### *2.4.3 Advantages and disadvantages of the pregnancy history technique*

This method of analysing survivorship has several advantages. Firstly, it permits the gathering of information on the survivorship experience of women over the entire span of their child bearing years. If such reports are accurate, this can provide an indication of the change in the mortality conditions faced by children of different cohorts.

Secondly, this method allows two types of factors to be related to survivorship. The first involves the characteristics of the mother or the family unit. The second involves characteristics directly related to birth, life or death of the child such as the length of time the child was breastfed, the age at death, and the age of the mother at the time of childbirth. Such data is usually analysed by relating the characteristics of the individual or the family directly to the survival or death. This technique provides an opportunity for a more conceptually clear analysis than is the case with studies that are forced to use aggregate data for geographical or other units. This is a very important advantage.

However, the disadvantage of the birth history data is that such data are subject to several problems of memory error as mothers tend to forget children who have died, or may even attempt to conceal such deaths. These problems are particularly evident for older mothers who are more likely to forget deaths that occurred in the more distant past, especially if these deaths occurred in early infancy. The longer a child has lived, the more likely she is to be remembered.

## 2.5 Methods of analysis

Infant mortality (age 0 to 11 months) and child mortality (age 12 to 59 months) are treated as dependent variables. Socio-economic and demographic characteristics are treated as independent variables. The socio-economic factors used in this study include parental education, paternal occupation, place of residence and household condition. Demographic characteristics include sex of the child, maternal age at child bearing and at first marriage, birth order, preceding birth interval, survival of preceding siblings and birth cohorts.

In addition to simple statistical measurements such as univariate and bivariate analysis that are usually used in describing the distribution of variables, life table analysis and the Cox regression multivariate analysis are employed in this study.

Chi-square statistics are used to examine whether there is any statistical relationship between two variables, while Gehan tests are used to examine whether there is any significant difference between the two survival function curves in the life table analysis.

Cox regression models (or proportional hazard models) is the method that is most suitable for the analysis of "survival data". A *Wald* test is used to examine the strength of the association between a particular independent variable and a dependent variable, while other independent variables are controlled. Forward selection, when variables are considered one at a time for entry into the model, was used to construct the model. The parsimonious models that were chosen were based on the level of significance of a probability of five per cent.

### *2.5.1 Characteristics of survival data and censoring*

Survival data arises when the aim is to study the time elapsed from some particular starting point to the occurrence of an event. The starting point of observation in studying infant and child mortality is the time of birth. The terminal event is the time of death. Survival analysis is useful whenever the researcher is concerned with not only the frequency of an occurrence of a certain type of event, but also the time process underlying such an occurrence.

A distinctive characteristic of survival data is that the event of interest may not be observed on every experimental unit. This feature is known as censoring. Censoring can arise because of time limits and other restrictions depending on the nature of the experiment. In epidemiological studies, censoring is mainly caused by a time restriction (Lee, 1989; Retherford and Choe, 1993).

In infant and child mortality analysis, the study continues until the time of the survey (cut-off date) or until the child reaches one year (for analysing infant mortality) and five years (for analysing child mortality).

A specific feature of survival analysis is that covariates may be time dependent, that is their value may vary during the period of observation. The age of an individual and the calendar period of observation clearly have a time-dependent nature, but other variables such as housing conditions might also change during the observation period.

### *2.5.2 Life table analysis*

The life table method was originally developed by demographers and actuaries to describe the lifetime of population. A population life table depicts the length of life of a hypothetical cohort, followed from birth to death, that is assumed to experience the same mortality rate as that estimated from the observed population. From life table data, it is possible to calculate the expected age of death of an individual at a given age and the probability of surviving from one age to another (Elandt-John and Johnson, 1980: 83-127)

In the life table survival analysis, the time reference of infants and children in the study should be fixed. Children are assumed to enter the analysis over the course of the study. Some children will die during the reference period and some will still be alive at the terminal date. Children who die during the interval have survival time (or ages at death) measured from their entrance (birth) to the time they die. A child who is still alive at the terminal date has survival times equal to their age in the survey. The length of time from birth to death (before age one) and from age one to death (before age five) are called the infant and child survival times respectively, and are the main variables analysed in this study. Selectivity and censoring are two types of biases common in survival analysis. For instance, the current mortality experience of babies born to women who died before the survey is not available and the mortality experience of babies born to women aged less than 15 years old, or older than 49 years old, is also not included in the survey. While these effects are likely to be relatively small the survival estimates by parity or by age of mother should be interpreted with some caution since this selectivity of cases will have some effect. It is also possible that some children may not be observed for the full time until death occurs. This incomplete observation is called censoring (Cox and Oakes, 1984; Lee, 1989; Retherford and Choe, 1993). If children have survived to the survey date but have not yet reached their first or fifth birthday, they are called censored observations (Retherford and Choe, 1993: 167). Censoring refers to the fact that the child might still die after the survey, but before the first or fifth birthday. The time reference of this chapter is limited to children born up to 10 years before the survey (mid 1984 to mid 1994).

A central life table function is the conditional probability of dying in a specific time interval (t, t+i). If there is no censoring the equation is defined as:

$$q_{(t)} = \frac{D_{(t)}}{N_{(t)}} \qquad q_{(t)} + p_{(t)} = 1$$

where t is the time of birth for the infant mortality estimate and the first birthday for the child mortality estimate; $q_{(t)}$ is an actuarial estimator or the probability of children dying between t and t+i; $p_{(t)}$ is the conditional probability of surviving from t to t+i. $D_t$ is the number of children dying during the interval t to t+i and $N_t$ is the number of children surviving at time t.

After considering the censored cases the equation can be defined as:

$$q(t) = \frac{D(t)}{N'_{(t)}} \qquad \text{Where } N'_{(t)} = N_{(t)} - 0.5C_{(t)}$$

Where $N'_{(t)}$ is the number of children who were left at time t and $C_{(t)}$ is the number of children who were censored during interval t to t+i. The assumption made in this estimator is that on average the children who were censored are exposed to the risk of dying for half the interval. The shorter is the interval, i, the more accurate this assumption will be.

In survival analysis, the distribution of survival times can be described using three functions, the survivorship function, the probability density function and the hazard function. The survivorship function (or more simply survival function) is denoted by $S_{(t)}$, and is defined as the probability that an individual survives longer than t.

$S_{(t)}$ = P(an individual survives longer than t)

$S_{(t)}$ = 1 - P(an individual died before time t)

$S_{(t)} = 1 - F_{(t)}$

Where $F_{(t)}$ is the probability that an individual died before time t.

By definitions, the probability of surviving to time 0 is 1. Thus

$$S_{(0)} = 1 \qquad F_{(0)} = 0$$

The probability of surviving to the start of each subsequent month can be calculated interactively:

$$S_{(1)} = S_{(0)}\, p_{(0)}$$
$$S_{(2)} = S_{(1)}\, p_{(1)}$$
$$S_{(3)} = S_{(2)}\, p_{(2)}$$
$$\vdots$$
$$S_{(11)} = S_{(10)}\, p_{(10)}$$

Thoee can be generated as:

$$S_{(t)} = S_{(t-1)}\, p_{(t-1)}$$
$$S_{(t)} = \prod_{i=0}^{t-1} p_{(i)}$$

where $\Pi$ is the product symbol, so that $S_{(1)}=p_{(0)}$; $S_{(2)} =p_{(0)}p_{(1)}$; $S_{(3)}=p_{(0)}p_{(1)}p_{(2)}$ and so on.

The probability density function is defined as the limit of the probability that an individual falls in the short interval t to t+$\Delta$t per unit width, or the probability of dying in a small interval per unit time. In this study, in the case of the estimate of the infant mortality rate, the unit width is one month while in the case of estimated child mortality rate, the unit width is 12 months.

The probability density function f(t) is estimated as the proportion of index children who died in an interval. It can be expressed as

$$f_{(t)} = \frac{\text{Number of index children dying in the interval beginning at time t}}{\text{(Total number of children)(interval width)}}$$

Another important measure is the hazard function denoted as $\lambda_t$. The hazard rate is a time specific mortality rate, defined as the index child's rate of death per unit of time. The hazard rate $\lambda_t$ is calculated as the observed number of deaths during the interval divided by the product of the time width of the interval (one month for the infant mortality estimates and 12 months for the child mortality estimates), and the average number alive during the interval, adjusted for censoring.

$$\lambda_{(t)} = \frac{D_{(t)}}{0.5[N_{(t)} + (N_{(t)} - D_{(t)})]}$$

The hazard function can also be defined in terms of the cumulative distribution function $f_{(t)}$ and the probability density function.

$$\lambda_{(t)} = \frac{f_{(t)}}{1 - f_{(t)}} = \frac{f_{(t)}}{S_{(t)}}$$

The cumulative hazard is defined as,

$$\Lambda_{(t)} = \int \lambda_{(x)} d_{(x)}$$

*Testing the difference between survival curves*

The differences between survival function curves can be tested using Mantel and Gehan tests. Gehan developed a simple significance test of the hypothesis that the two populations are the same. The test is performed by comparing every observation in the first sample with every observation in the second sample (Brown and Hollander, 1977).

This study applied the Gehan test for measuring the significance of differences between two or more survival function curves or levels within one variable. The Gehan test (Breslow test or generalized Wilcoxon test) is based on the ordering of the failure times, from earlier to later. From the ordering, the Gehan test checks to see if the failure times of individuals in one group tend to occur earlier or later than the failure times of another group. This method has been generalised by Gehan to allow for censoring and by Breslow to permit comparison of more than two groups. If p <

0.05, the survival function curves or levels differ significantly from each other at the five per cent level (Retherford and Choe, 1993: 177, Cox and Oakes, 1984: 124-128). The Gehan test works better in detecting large differences between the two survival curves (Retherford and Choe, 1993: 178).

### *2.5.3 Cox regression analysis*

In 1972, D.R. Cox proposed the Proportional Hazard Model, which is viewed as a multivariate life table by incorporating the covariates of interest into the analysis. In ordinary life table analysis, it is assumed that the population is homogeneous, meaning that each sample member has the same underlying hazard function. In proportional hazard models, the hazard is not only a function of time, but also a function of the specified predictor variables (Retherford and Choe, 1993). Its main use is not to calculate life tables, but rather to assess the effects of the predictor variables on the hazard function, which is viewed as a response variable. The variables included in the model are the predictor variables. The underlying assumption for this model is that the covariates under study have multiplicative effects on the baseline hazard function. The model does not assume any distribution form of the baseline hazard function. This model has many advantages. They are:

- The estimated effect of a covariate is positive for the entire domain of the covariate.
- The effect of a covariate is monotonic. If $B$ is the regression coefficient of the covariate, one unit increase in the covariate multiplies the hazard function by $e^B$ when the other covariates in the model are constant. The quantity $e^B$ is called a relative risk.
- The vector of covariates can include any type of variable that can adjust for confounding factors and test for interaction among variables.
- The coefficients of covariates are easy to interpret.

Because of its desirable properties the model has been used extensively.

*Multiplicative risk function*

Basically, the coefficient of the covariate of any statistical model should have meaning. For example, the coefficient of an independent variable in the linear regression model means that increasing one unit of the independent variable changes the value of the dependent variable equal to the value of the coefficient of that independent variable. But the meaning of the coefficients of different models are not the same.

As has been mentioned above, this model assumes that the covariates under study have multiplicative effects on the baseline hazard as well as on other covariates in the model. It has the functional form as follows:

$$h(t;z)=h_0(t)\, e^{B_i z_i}$$

$$h(t;z)=h_0(t)e^{B_1 z_1+b_2 z_2+b_3 z_3 \cdots\cdots\cdots\cdots +B_p z_p}$$

where $h(t;z_i)$ is the hazard or instantaneous death rate at time $t$ for an individual with covariate $z_i$ *to* $z_p$; $h_0(t)$ is an arbitrary unspecified baseline hazard function for an individual with covariate $z$=0.

$B_i$ is an unknown regression coefficient associated with $z_i$. The exponential of the $B_i$ coefficient, or the effect of each covariate, is interpreted as the relative risk in developing the response (disease or death) as compared to its reference category. For example, assuming that there is a dichotomous variable $z_i$, which takes the value zero and one, and its effect has to be estimated. This can be carried out by dividing both sides of the above equation by $h_0(t)$

We will get

$$\frac{h(t;z)}{h_0(t)} = \frac{h_0(t)e^{Bz}}{h_0(t)} = e^{Bz}$$

Exp($B$) or $e^B$ is the relative risk (RR) due to the covariate $z$. If the relative risk is less than 1, it means that the variable increases the survival rate and the hazard rate decreases; if equal to 1, the variable does not influence the survival rate; and more than 1, the variable decreases the survival rate and increases the hazard rate.

### *2.5.4 Limitation of analysis*

As access to and quality of health services are not measure, there is an implicit assumption that the quality of health care services is the same for all respondents. The 1991 and 1994 Indonesia Demographic and Health Surveys are cross-sectional surveys of pregnancy histories. Some of the information may not be applicable to index children born some years before the surveys such as, toilet facilities, place of residence and sources of drinking water. There may be problems of recall bias or under-reporting of deaths during the first year of life, particularly for neonatal deaths.

More information is needed to have a better understanding of the role of maternal education on infant mortality. This includes knowledge about disease causation, prevention and control, maternal nutritional status, causes of death, etc. Such information is not available in these data sets. Therefore, the study is limited by the information available.

## 2.6 Summary

The 1991 and 1994 Indonesia Demographic and Health Surveys (IDHS) are the most complete and reliable data on child mortality in Indonesia at the moment. These data allow a detailed analysis of infant and child mortality because they contain retrospective history data which can be linked with several household and parental variables. However, the 1991 and 1994 IDHS did not include information about the cause of death which is very important in the analysis of infant and child mortality. In tandem with the 1994 IDHS, an expenditure survey was conducted using half the 1994 IDHS sample. However, the expenditure data seem unreliable because the questionnaire was not detailed containing only eight major groups of expenditure.

The life table Cox regression and methods are appropriate for the analysis of infant and child mortality because the dependent variables used in this study were the probabilities of children dying under age one and ages 1-4 years. In addition, these methods are suitable for the analysis of time-event data. Using these methods also allows us to analyse all of the index child cases. Using the results recent infant and child mortality rates can be estimated according to various charachteristics of the respondents.

Chapter Three discusses the background and health development of Indonesia. Background information includes geographical condition, administration system, and economic and population policy such as urbanisation and transmigration. Health development information includes health facilities, community participation in health services, health manpower, health budgeting and family planning.

# 3

# Country background and health development in Indonesia

## 3.1 Background

Indonesia is the world's largest archipelago consisting of five major islands and roughly 13,700 islands scattered over 5,120 kilometers. Fifty six per cent of islands are unnamed and only seven per cent of them are inhabited. The archipelago is at the crossroads between the Pacific and the Indian oceans, bridges two continents (Asia and Australia), and straddles the equator. This strategic position has influenced the cultural, social, political and economic life of the country.

The tropical archipelago is predominantly mountainous with a myriad of rivers and canyons. Fifty-two active volcanoes have erupted within the last 400 years (CBS, 1996a). Tectonic earthquakes, which often strike Indonesia, are influenced by the Circumference Pacific and Mediterranean fault lines, which converge in Indonesia. The presence of high mountain ranges has resulted in transportation and communication problems in certain areas. Transportation and communication links are very limited between islands. Outside the Java islands, even contact between people on the same island is often difficult. Most of the wide plain areas are located in East Sumatra, South Kalimantan and South Irian Jaya. These plains are mostly swamp areas which are influenced by sea tides and during high tide, seawater can extend ten-kilometers inland.

The Central Bureau of Statistics estimated that the population of Indonesia broke through the 200 million people mark on 4 February 1997 (Kompas Online, 6 February 1997). The population is scattered unevenly across the archipelago. Java, which is only about 6.9 per cent of the land size, is populated by almost 60 per cent of Indonesia's population. This is an indication that the development plan is still focused on the Java region. Population density in Java in 1961 was 476 persons per square km compared to 19 per square km in outer Java. In 1995, the population density become 868 and 45 per square km for Java and outer Java respectively (Table 3.1). The annual population growth rate was 1.7 per cent during 1990-95. The average population density is 101 people per square kilometer (CBS, 1996a: 34-37).

There are more than 300 ethnic groups and more than 250 languages are spoken in Indonesia. The largest ethnic group is the Javanese, 45 per cent of the total population. The Sundanese make up 14 per cent, followed by Madurese 7.5 per cent, and Coastal Malay 7.5 per cent.

Table 3.1 Percentage and density per square km of population in Java and outer Java, Indonesia 1961-1995

| Year | Percentage | | Density/km | | |
|---|---|---|---|---|---|
| | Java | Outer Java | Java | Outer Java | Indonesia |
| 1961 | 65.0 | 35.0 | 476 | 19 | 51 |
| 1971 | 63.8 | 36.2 | 576 | 24 | 62 |
| 1980 | 61.9 | 38.1 | 690 | 31 | 77 |
| 1990 | 60.0 | 40.0 | 814 | 40 | 93 |
| 1995 | 58.9 | 41.1 | 893 | 45 | 102 |

Source: CBS, 1995b

The government only recognises certain religions (*agama*) which by law are monotheist. They include Islam, Catholicism, Protestanism, Hinduism and Buddhism. The largest number of registered religious adherents were associated with Islam. This made Indonesia the largest Islamic country in the world (Hugo et al., 1987). Islam came to Indonesia between the twelfth and fifteenth centuries via the coastal regions of Sumatra, northern Java, and Kalimantan. Hinduism in Indonesia is primarily associated with Bali. Hindus represented only around two per cent of the population in the early 1990s. Buddhism accounts for less than two million people or one per cent of the population. Most Buddhists are of Chinese ethnic origin.

### *3.1.1 Urbanisation*

Another phenomenon is the increasing percentage of population who live in urban areas, from 14.9 per cent in 1961 to 22.4 per cent in 1980 and to 35.0 per cent in 1994. Urban growth is due to three factors: natural increase of urban population, redefination[4] of city boundaries and rural-urban migration (Jones, 1988: 137). Redefination of city boundaries or the changing status of rural and urban areas was due to the development of infrastructure in rural areas such as education, electricity, transportation etc. Jones argues that 'excessive rural-to-urban migration' is caused by the 'urban biased' of government policies. Urban areas have always held a significant attraction for Indonesia's rural population because of higher labor wage rates and the greater availability of facilities such as education, housing, health and entertainment (Jones, 1988).

While access to health care services, clean water and adequate sanitation is still generally better for urban than rural areas the rapid influx of rural migrants has created enclaves of urban poverty in the form of slums and squatter settlements, especially in the large cities. People who migrate to the cities usually maintain their rural habits. Being poor, they tend to locate in slum areas and consequently lack clear property rights. Not all migrants are able to obtain jobs, even temporary jobs. These conditions create stress, accidents, and environmental and health problems. The infant and child mortality rates these groups of people were high.

High-school and college graduates, with no prospect of employment in the rural areas, have a greater chance to find employment than rural migrants without capital or qualification. Unqualified migrants tend to work in the "informal sector" such as street vending, scavenging, and short-term day labor. The pace of urbanisation is expected to increase over time.

---

[4] The number of village (desa) classified as urban almost doubled between 1980 and 1990 from about 3,500 to approximately 6,700 (Hugo, 1993: 47).

Efforts to increase income equity, the introduction of appropriate agricultural technologies, improvements in communication, job opportunities, additional education and recreational facilities in rural areas may reduce the pace of urbanisation. A more effective, efficient and appropriate transmigration program may also contribute to a reduction of urbanisation.

Ananta and Arifin (1991) note that the percentage of population in urban areas is projected to increase from 28.8 per cent in 1990 to 52.2 per cent in 2020 (Ananta and Arifin, 1991). This rapid urbanisation will pose problems such as urban poverty, property rights, transportation, environmental management, street children and commercial exploitation of children. The provision of health services to massive urban populations will be a major challenge.

### *3.1.2 Transmigration*

Transmigration is the government's effort to resettle people from densely populated regions to sparsely populated areas, so as to develop both the regions of origin and the new settlement areas. The uneven distribution of population and manpower between islands and regions can be attributed to the restricted availability of agricultural land, fragmentation of authority and land ownership, and the expansion of the number of agricultural plots. Government of Indonesia started this program in the 1950s after independence, but did not gain momentum until 20 years later. From 1969 to 1989, some 730,000 families have transmigrated from the overpopulated islands of Java, Bali and Madura to less populated islands. Nearly half of these migrants went to Sumatra. Some of them went to Kalimantan, Sulawesi, Maluku and Irian Jaya. However, people continue to be attracted to Java which offers better employment opportunities as well as education and health facilities, and a counter-stream of migrants into Java offsets government-sponsored transmigration out of Java. In addition, land disputes with indigenous inhabitants, deforestation, and problems in agricultural productivity, transportation, and social infrastructure present continuing difficulties for this program.

### *3.1.3 Administrative structure*

Indonesia's government has a strong presidential system. The president is elected for a five-year term by the majority vote of the People's Consultative Assembly (MPR), and may be re-elected when his term expires. In carrying out his duties, the president is the Mandatory of the MPR, responsible to the MPR for the execution of state policy. The president is assisted by state ministers appointed by him. In 1993, there were 21 departments headed by ministers, and 13 state ministers were grouped under four senior coordinating ministers (Government of Indonesia [GOI], 1993).

The structure of the country is unitary. It is sub-divided into 27 provinces, 243 regencies (*kabupaten*) 62 municipalities (*kotamadya*), 3,844 districts (*kecamatan*) and 65,852 villages (*desa*) (CBS, 1996a: 5). At provincial and regency or municipality levels there is an elected regional representative council. Provinces are governed by governors (*gubernur*) who are elected and are responsible to the President. Regencies and municipalities are governed by *bupati* and *walikota* who are responsible to the Minister of Home Affairs. Furthermore, *kecamatan* and *desa* are governed by *camat* and *lurah (kepala desa).*

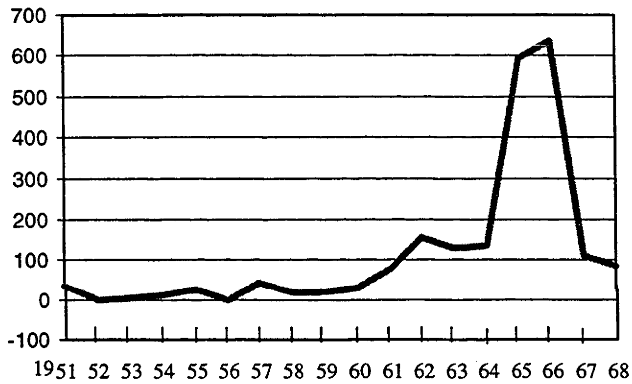
### *3.1.4 Economy*

In the first decade after independence (1945), Indonesia experienced civil unrest and political instability. During the 1950's and 1960's, Indonesia economy was almost stagnant due to low economic growth and high inflation (Hugo et al., 1987: 244). In the period from 1951 to 1957, national inflation fluctuated. In 1951, the inflation rate was 34.9 per cent, while in the next year there was deflation of 1.7 per cent. The highest inflation rate in the 1950s was in 1957 when it reached 42.2 per cent, while a year before it was 0 per cent (CBS, 1995b).

Between 1958 and 1968, the Indonesian economy deteriorated and suffered from uncontrollable inflation. Inflation rates increased dramatically reaching 154 per cent in 1963, 594.4 per cent in 1965, and 635.4 per cent in 1966. In 1967 and 1968 the inflation rate fell to 112.2 per cent and 85.1 per cent respectively (CBS, 1995b). In 1966, Indonesia experienced money searing, one thousand *rupiahs* becoming one *rupiah*. As a result, the living standard of the people as well as the Gross National Product (GNP) declined rapidly (CBS, 1995b).

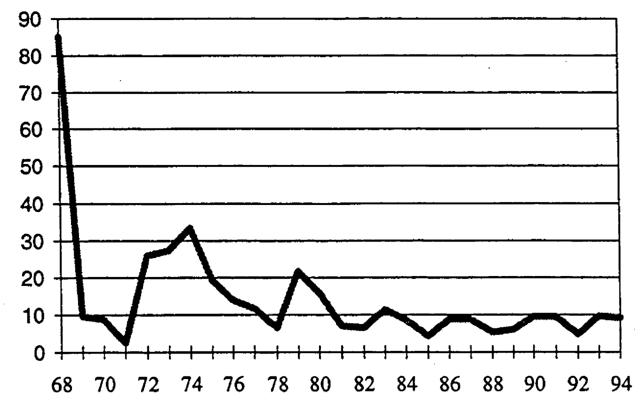
In an attempt to overcome the economic difficulties, the New Order Government launched a new development policy in 1969 in the form of a five-year development (*Pembangunan lima tahun* [*Pelita*]). In the first year of *Pelita* I, the inflation rate was reduced to 9.9 per cent, and the inflation rate has been controlled at a constant level below 10 per cent in the 1980's (Figure 3.2).

Figure 3.1 National inflation, 1951-68 (per cent)




Source: Table A.3.1

Figure 3.2 National inflation, 1968-94 (per cent)




Source: Table A.3.2

During the first long-term development plan, 1969-93, Indonesia experienced an average economy growth of 6.8 per cent annually, and in the period 1995-96, the economic growth was 7.9 per cent, with an income per capita of US$1,023. This achievement placed Indonesia among the ranks of "middle-income" countries according to the World Bank classification in 1994 (CBS, 1995b, 1996b).

However, the gap between the highest income and the lowest income increased between 1985 and 1990. In 1985, the average per capita income per annum of agricultural workers was Rp 247,400 while for highly paid workers in urban areas it was Rp 906,600, a ratio of 1:3.8 between the lowest and the highest income. In 1990 the gap between the lowest and the highest increased to 1:4.3 (CBS, 1995b).

During the succession of Five-year Plans (Pelita), the new order government successfully survived a number of hardships and challenges and is now implementing the sixth plan. The current plan emphasises (a) the agricultural sector and industries that are geared towards producing export oriented goods; (b) industries that can absorb manpower; (c) industries producing machinery for processing agricultural products and (d) industrial machinery (GOI, 1993).

Indonesia has achieved steady economic growth, and has had some success in industrialisation, in maintaining sustainable agriculture, in achieving self sufficiency in food production, and in poverty reduction. This is in contrast with the difficulties that other countries have experienced. There has been a dramatic reduction in the proportion of the population living in poverty. Further, there is a strong political commitment to alleviate poverty which holds great promise for tomorrow's children. While 70 million or 60 per cent of the people were living below the poverty line in 1970, this number dropped to 20 million or 11 per cent in 1996 (CBS, 1995b: 191; Kompas Online, 9 September 1997). On 8 September 1997, the United Nations Development Program (UNDP) acknowledged the remarkable achievement and commitment of President Soeharto and the Indonesian people to alleviate poverty in Indonesia (Kompas Online, 9 September 1997).

*The recent economic condition*

While finishing this thesis, Indonesia was experiencing a financial crisis. This crisis was also evident in a number of ASEAN countries including Thailand, Malaysia, Singapore, the Philippines and South Korea. The ASEAN financial crisis was triggered by the economic crisis in Thailand.

The Indonesian economy is very vulnerable to disruption because of the very large amount of un-hedged foreign debt. The extent of Indonesian companies, debt exoposure is massive and could be as high as $US80 billion. It has been estimated that about 40 per cent of this debt is scheduled to be repaid by the end of 1997 and it is not clear how much of the debt is hedged. Indonesian private companies have larger foreign debts than their colleagues in Malaysia and the Philippines. Despite the tendency within South-East Asian countries to put all the blame for their currency crises on foreign speculators, the scramble for US dollars by Indonesian companies facing loan repayments has also contributed to the fall in the rupiah (Sydney Morning Herald, 10 October 1997).

To avert a looming financial and economic crisis the government of Indonesia called in the International Monetary Fund (IMF). The IMF package consisted of funds and a policy package, better known as the reformation package. The IMF gave a US$23 billion multilateral financial package, involving the World Bank and Asian Development Bank, to help Indonesia stabilise its financial system (Kompas Online, 3 November 1997; The Age Online 13 January 1998). Along with the IMF package, the government withdrew the business license of 16 private banks on the 1st of November 1997 (Kompas Online, 3 November 1997). Further on 15 January 1998, President Soeharto signed the "Letter of Intent" with the executive director of the IMF. In this letter the Government conceded that the inflation rate will reach 20 per cent in 1998 instead of its forecasted nine percent, and zero economic growth instead of the four per cent stated in the budget plan (RAPBN [Rencana Anggaran Pendapatan dan Belanja Negara]). For a healthy economy President Soeharto agreed that the fuel and electricity subsidy should be withdrawn so that very important projects could be financed. He agreed to abolish the monopoly of sugar, flour, wheat and soybeans which was controlled by the Logistics Bureau (BULOG). Only rice is now still under control by the BULOG. Subsidies for the national car and aircraft industries were also removed (Kompas Online, 16 January 1998; The Australian Financial Review, 16 January 1998).

Before the IMF come to help, the rupiah exchange rate against the US dollar hit Rp 4,000 per dollar. After about a month of negotiating, and agreement with the IMF being reached, the rupiah strengthened sharply to Rp 3,550 per dollar. Two and half months after that the rupiah again declined, reaching Rp 16,500 per dollar on 22 January 1998 (Suara Pembaharuan Online, 10 October 1977, 22 January 1998).

The economic analyst, Kwik Kian Gie, stated that the problem is not only an economic one, but a cultural problem, particularly colusion, corruption and nepotism which makes the Indonesian economy a high cost economy (Kompas Online, 22 September 1997). Furthermore, Rudini, the Chairman of the Study of the Indonesian Strategy Institute (LPSI), stated that the present monetary problem can not be detached from politics because the two are interrelated. The government has to prepare a strategy to face the negative side of monetary saving including the possibility that social riots will occur in the following months. He also stated that there is a need to anticipate the possibility of social upheaval, as many enterprises close down and the price of daily requirements increase. He said that the problem is quite serious "At the time that the economy is booming the poor people less benefit, they remain poor. But at the time that economy is worsening the people also directly account for it," (Kompas Online, 12 November 1997).

In addition, economic expert Prof. Dr Sumitro Djojohadikusumo disclosed that the problem happening now is no longer monetary, and does not just involve the people's economy, but also involve a credibility crisis that is blighting the entire community's political life (Kompas Online, 11 January 1998). The effect of the 1997/98 crisis may be severe but it too early to be certain.

### *3.1.5 Education*

Education is unquestionably an essential element of social welfare. It is essential not only for individual growth and development but also for the welfare of the whole society. The Indonesian government has long implemented major policies to expand the education system. The number of schools have dramatically increased, teacher/student recruitment techniques have been revised, infrastructure of the educational system has been improved, school fees have largely been eliminated, subsidies have been provided for text books, and an informal education program has started for adults.

In the early 1980s, Indonesian children between seven and twelve years of age were required to attend six years of primary school following kindergarten. The success of the program has encouraged the government to expand compulsory education to nine years, starting at the beginning of *Pelita* VI (1994/95). This means that boys and girls are expected to complete Junior High School or not leave school until they reach age 16 (CBS, 1997).

Achievement in education is reflected in literacy rates and the mean years of schooling. The literacy rate for adults (over 10 years of age) increased from 84.1 per cent in 1990 to 87.4 per cent in 1995. The increase is more impressive in rural than in urban areas. In 1995, the overall urban-rural gap in the literacy rate was about 10 percentage points (CBS, 1997). *Susenas* data show that in 1994 the overall mean years of schooling was 6.5 years, equivalent to a primary school graduate. The figure varied widely among provinces, from 3.6 years in East Timor to 9.2 years in Jakarta (CBS, 1997).

Table 3.2 School participation rates according to age group, sex and area, 1990 and 1995

| | | 1990 | | | 1995 | | |
|---|---|---|---|---|---|---|---|
| Age | Sex | Urban | Rural | Total | Urban | Rural | Total |
| 7-12 | Male | 95.1 | 89.9 | 91.4 | 97.1 | 93.2 | 94.5 |
| | Female | 95.1 | 90.1 | 91.6 | 97.1 | 93.6 | 94.7 |
| | Total | 95.1 | 90.0 | 91.5 | 97.1 | 93.6 | 94.6 |
| 13-15 | Male | 83.0 | 60.0 | 66.9 | 88.4 | 71.1 | 77.2 |
| | Female | 75.8 | 56.2 | 62.5 | 84.7 | 68.3 | 74.3 |
| | Total | 79.4 | 58.2 | 64.7 | 86.5 | 69.8 | 75.8 |
| 16-18 | Male | 64.2 | 33.0 | 43.7 | 66.8 | 37.2 | 48.9 |
| | Female | 54.6 | 27.0 | 37.3 | 58.1 | 30.1 | 41.9 |
| | Total | 59.2 | 30.1 | 40.5 | 62.4 | 33.8 | 45.5 |

Source: CBS, 1997

Table 3.2 shows the increase in school participation rates for all age and sex groups during the period, in both urban and rural areas. The increase was more remarkable for the age group 13-15 than for the other two age groups.

The relatively small excess of males over females with respect to school participation compared to many other developing countries can be attributed to traditional cultural values that place only a slight priority in educating males rather than females. It is not uncommon for a family to send a son rather than a daughter to school if a choice has to be made, and some parents remove their daughters from school at an earlier age than their sons because they feel it is the 'proper' thing to do. The disparity in literacy that exists between the sexes is also found between urban and rural areas. The primary reasons given for these differences are unequal allocation of resources and the labour demands placed on the young in rural areas.

## 3.2 Health development in Indonesia

### *3.2.1 Introduction*

In the 1970s and the 1980s, health in Indonesia showed overall improvement. The World Bank reported that health improvement in Indonesia has been "solid and impressive" (World Bank 1991: xi; Corner and Rahardjo, 1995: 77-103; Hull and Hull, 1995: 120-148). Life expectancy at birth for men was 59.6 years and for women was 63.3 years in 1990 (CBS, 1993b). By the year 2000-4 period, life expectancy is projected by the World Bank to reach 66.5 years for men and 69.7 years for women. However, the improvement in life expectancy is less impressive compared to other South East Asian countries. Indonesia's performance in the level of infant mortality achievement still lags far behind comparator countries (Table 3.3). Within Indonesia, substantial regional disparities exist in the infant mortality rate, and in 1990 ranged from a low of 37 per thousand births in Yogyakarta to a high of 141 in West Nusa Tenggara (Hull and Hull, 1995).

Table 3.3 Comparative infant mortality rate and life expectancy between Indonesia and selected countries, 1994

| Country | Infant mortality per 1,000 live birth | Life expectancy at birth (years) |
|---|---|---|
| Indonesia | 67 | 61 |
| Malaysia | 26 | 69 |
| Philippines | 51 | 65 |
| Thailand | 37 | 68 |
| Singapore | 6 | 76 |
| Papua New Guinea | 63 | 56 |
| Vietnam | 46 | 65 |

Source: Bureau of Census, US Department of Commerce, 1994

Health care in Indonesia is delivered through the National Health System (*Sistem Kesehatan Nasional* [*SKN*]) which is administered by the Ministry of Health. SKN is a system which reflects the efforts of Indonesians to improve their capability for achieving optimal health status as one of the realisations of community welfare as stated in the preamble to the 1945 Indonesian Constitution (Yahya, 1985: 32-40; CBS, 1992b; MOH, 1993).

SKN defines five major objectives. These are

a. to enable the people to take care of their own health and to live a healthy and productive life.

b. to promote an appropriate environment in support of the health of the people.

c. to improve the nutritional status of the people

d. to decrease the morbidity and mortality rates

e. to promote a healthy and prosperous family life through the acceptance of a 'small, and happy family' norm.

In the period of Pelita I (1969-74), the health status indicators portrayed a less than favorable situation. During this period, Indonesia made substantial investment into basic infrastructure and human resources in order to obtain a comprehensive primary health care delivery system. The community health centre (*Puskesmas*) is the most basic organisational unit in delivery of health care in Indonesia that provides preventive care, curative care, health information, and rehabilitative services. The objective of health centres is to improve health service coverage, bringing health care programs closer to the community (Poernomo, 1985: 66-70; MOH, 1993).

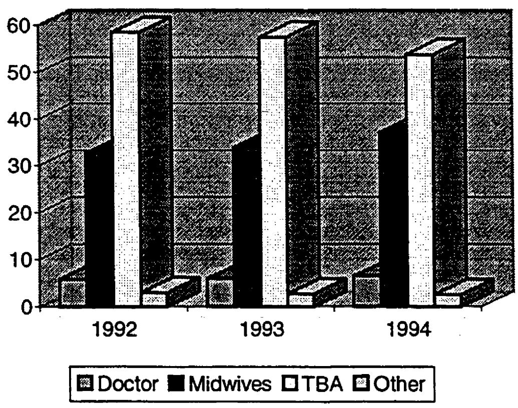
During Pelita II (1974-79), there was a continuation of activities initiated in Pelita I, however priority was given to the improvement of health resources. These efforts supported equitable distribution of health care services to the community. In this period, efforts began to improve the ability to undertake annual health planning (MOH, 1993).

Pelita III (1979-84) saw significant efforts to improve equity in health care services and increased community participation, with intersectoral coordination becoming more important. During this period concepts such as the operationalisation of the health care system as mentioned in the SKN and the long term development plan for health manpower, *Puskesmas*, were developed or refined. The development of planning, organisation, controlling, monitoring and evaluation were pursued.

Although previous developments in health management resulted in major health improvements, there were several problems that still needed to be solved in the period of Pelita IV (1984-89). The operational management at the national and regional levels was still weak. Capable leadership at the health unit level was still limited. Law and research in health were still inadequate. Coordination and integration of control were not functioning smoothly (MOH, 1993).

The government of Indonesia and UNICEF gave high priority to the development of the health service delivery system, particularly the maternal and child health and welfare centres. Until 1994, the majority or 53.8 per cent of deliveries were still attended by traditional birth attendants (TBA). The deliveries attended by a doctor or a midwife were 6.5 per cent and 37.1 per cent, respectively (Figure 3.3)

Figure 3.3 Percentage of deliveries according to type of attendance, Indonesia: 1992-94




Source: Table A.3.3

Between 1968 and 1984, 70,000 traditional midwives were trained, registered and given a mid-wife kit. In 1989 the government started a new program to assign qualified midwives to all villages in the country to improve assistance to women giving birth through supervision of TBAs as well as more prompt and appropriate intervention and referral in case of difficulties. Between 1989/90 and 1994/95, 49,300 midwives were assigned to villages encompassing 91 per cent of all villages. UNICEF has given major support to the training component of this program (UNICEF, 1996).

### *3.2.2 Health facilities*

Since Pelita I, health service development activities have been carried out through health centres and hospitals. Based on the 'Alma Ata declaration', one of the most important health center activities is Primary Health Care (PHC). In Indonesia Primary Health Care is usually provided through community health centers (*Pusat Kesehatan Masyarakat* [*Puskesmas*]) and sub centers (*Puskesmas pembantu* [*Pustu*]) (World Bank, 1991; Corner and Rahardjo, 1995; Hull and Hull, 1995). *Puskesmas* are staffed by lower level health staff (nurse, sanitarian, vaccinator and midwives) and are supposed to be headed by a doctor, although a significant minority lack a doctor, especially in the outer islands (World Bank, 1991; Hull and Hull, 1995). From the early 1990s, government began to upgrade *Puskesmas* by adding up to twenty beds to enhance maternity care and stabilise acute diarrhea cases. This upgrading was taken in order to make clinics into functioning Class D hospitals. It is planned that Class D hospitals will be renamed "*Puskesmas* with beds" (Hull and Hull, 1995: 120-148).

The total number of health service facilities or delivery sites has continuously increased from 3,735 in 1974/75 to 5,174 in 1986, and by the third year of Pelita V (1992/93) there were 7,073 health centres, 17,465 sub-health centres, and 4,618 mobile health centres (World Bank, 1991: 48; CBS, 1996a). These numbers will increase in line with population growth in order to achieve equity in the provision of health services.

Nevertheless the provision of community health centrers in Indonesia remains low compared to other developing countries. For example, China had an average of 63 health centres per million people, or roughly double Indonesia's average of 32 per million. In Thailand, the availability of health centers is five times higher at around 141 per million people (World Bank, 1991).

The accessibility of health centres shows enormous inter-provincial variation, ranging from an average distance of 0.8 km in Jakarta to 32.6 kms in Irian Jaya. The number of doctors per health centre also varies between regions from only 0.35 in Irian Jaya to 1.78 in Jakarta (Table A.3.4). Thus, the poor not only have less access to a health centre, but they are also less likely to be served by a doctor once they get there (World Bank, 1991).

Hospitals are divided into four classes, A, B, C and D. An A-class hospital has more than 1,000 beds, and B-class has 400-1,000 beds. Both are staffed by principal specialists and sub-specialists. Class C and D hospitals have 100-400 and 25-100 beds respectively and are staffed with the basic types of specialists, pediatricians, obstetricians/gynecologists, internist, surgeons and three other supporting specialists. By the end of Pelita V, there were 1,472 hospitals with a total of 132,158 beds. The ratio of hospital beds to population is 1:1,500. In 1991, the bed occupancy rate average was 60 per cent, and length of stay was six days (MOH, 1993: 103).

Improvements in the health of Indonesians have been realised largely without the benefit of enhanced hospital services. Indonesia's ratio of hospital beds of 60 per 100,000 in the late 1980s was the lowest among ASEAN nations; the ratio ranged from a high of 500 per 100,000 for Singapore to the second lowest, 140 per 100,000 for Thailand. Indonesia's rank in beds per 100,000 population is one of the lowest among developing countries regardless of income level (Table 3.4). Indonesia's ratio of hospital beds is only about one-quarter of the ASEAN countries average and less than three-quarters of other low-income countries. The low level of hospital beds is unequally distributed throughout Indonesia, ranging from a low of 18 beds per 100,000 people in Lampung Province to 124 per 100,000 in Jakarta (Table A.3.5).

Table 3.4 Comparative hospital bed ratios

| Country | Beds per 100,000 population |
|---|---|
| Indonesia | 60 |
| Malaysia | 250 |
| Philippines | 200 |
| Thailand | 140 |
| Singapore | 500 |
| | |
| Low income | 90 |
| Lower middle income | 130 |
| Upper middle income | 250 |
| Industrial market economy | 1,000 |

Source: World Bank 1991

The utilization of hospital services is extremely low relative to neighboring countries. Hospital utilisation rates are particularly low among the poor, as demonstrated in the close association between interregional differences in utilisation rates and household income. Poor people not only have less access to hospital facilities but also face a lower quality of service. The ratio of doctors per hospital bed tends to be lower in poorer provinces. Provinces with higher local revenue received more health subsidies of than those with lower local revenue. Jakarta received twice the central subsidy for health per capita compared to West Nusa Tenggara (World Bank, 1991; Hull and Hull, 1995: 120-148). The World Bank concluded that low quality services are a key determinant of the low level of hospital utilisation in Indonesia (World Bank, 1991).

### *3.2.3 Community participation in health services*

The broad Guidelines of State Policy (GBHN) 1978 indicated that active community participation in national development must be widely developed. GBHN in 1988 also stated that the national health system would continue to increase the involvement of the community in health development. Community participation is a significant dimension of health program development at all levels. There are three different types of participatory initiatives that have been developed in the Indonesian health care system. These include community-initiated programs, village community health programs (PKMD), and privately initiated programs. The organisation is more a quasi-government organisation than a voluntary group, because volunteers at village-level are members of the national women's movement (Family Welfare Education or *Pendidikan Kesejahteraan Keluarga* [PKK]) which is headed by the wife of the Minister of Home Affairs (Hull and Hull, 1995: 120-148).

Community participation in health programs has been realised through the Integrated Health Service Post or "*Posyandu*" (*Pos pelayanan terpadu*). *Posyandu* is developed by and for the community where its activities consist of five programs including family planning, maternal child health (MCH), nutrition, immunisation and distribution of oral rehydration salts (ORS) (World Bank, 1991: 48).

*Posyandu* are staffed by volunteers (*kaders*) from villages who have received a three to six days training course from the health centre staff (Berman, Gwatkin and Burgur, 1987; Hull and Hull, 1995: 120-148). With such a short training duration, it will be difficult for cadres to master even the non-technical aspects of their work (Hull and Hull, 1995:120-148). Activities of the volunteers are supervised by health center staff and family planning field workers, who provide immunisation and keep *Posyandu* supplied with ORS (oral rehydration salts) packets, growth-monitoring cards and family-planning supplies.

The total number of *Posyandu* has increased rapidly from 90,000 *Posyandu* in 40,000 villages in 1984 to more than 245,000 in 1992 (MOH, 1994a). Today, *Posyandu* are found in virtually all of the 64,000 villages in Indonesia. They are run by an estimated 1.4 million trained volunteers (UNICEF, 1996). In Java-Bali most households are within one kilometer of a *Posyandu*, while in provinces where the population is scattered, a household may be anywhere from two to fifteen kilometres from a *Posyandu* (Table A.3.4)(World Bank, 1991: 50). The *Posyandu* system is often credited with a major role in the dramatic improvement of the health status of the population, especially in child welfare and family planning (Brotowasisto et al., 1988: 131-140).

By 1974 national commitment to improve child nutrition through the family nutrition project (*UPGK=Usaha Peningkatan Gizi Keluarga*) was established with the full support of President Soeharto. In ten years, UNICEF gave strong support for the training of government field workers and village volunteers, and provided supplies and baby weighing equipment. During this period the program expanded. By 1984, UPGK was established in more than 31,000 villages through *Posyandus* and by 1995 there were nearly 264,000 *Posyandus* serving as the primary health centres for the mass polio campaign that immunised 23 million children. A joint World Bank-

UNICEF evaluation of the UPGK Family Nutrition Program in 1990 considered that the *Posyandu* system had probably contributed to 15 per cent of the reduction in infant mortality during the 1980 to 1990 period (WHO, 1985: 125; UNICEF, 1996).

With the improvement in the community's socio-economic condition and health status and change in government policy, it is anticipated that Posyandu's activities will change with the addition of health insurance, simple curative care, and environmental health services, etc.

### *3.2.4 Health manpower*

The sufficient and equitable distribution of medical personnel is a decisive factor in determining the community's standard of health. The number of health care personnel gradually increased in the 1980s. By the end of the decade, there were more than 23,000 physicians, 76,000 midwives, and nearly 70,000 medical assistants, paramedic and other health care workers. The ratio of doctors to population improved from approximately one doctor per 23,000 people in the beginning of Pelita I to one doctor per 10,500 people in 1992 (MOH, 1993; 1994b). However, during Pelita IV, the government was unable to absorb all doctors and paramedical graduates due to budgetary constraints on hiring (World Bank, 1991: xvi; Hull and Hull, 1995: 120-148).

The distribution of Indonesian health care workers was highly uneven. This is because the government had difficulty in obtaining paramedics to work in remote rural areas. As a result, there were overstaffed hospitals and administrative health offices and understaffed health centres especially in remote areas. The World Bank reported that more than one-quarter of health centres in eleven provinces lacked of doctors (World Bank, 1991: xvii). To alleviate the problem of the maldistribution of physician the government required two to five years of public service by all medical school graduates whether publicly or privately trained. In order to be admitted for specialist training, a physician had to complete this public service (MOH, 1993: 114). Since then, doctors have been complaining about their obligation to serve in remote and difficult regions with low salaries. In 1992, medical graduates were no longer obligated to join the public service, but they were encouraged to take 'temporary' service posts in *Puskesmas*, with salary depending on the degree of isolation and difficulties they faced (Hull and Hull, 1995: 120-148).

The World Bank also reported that the average productivity of Indonesia's health personnel is low. This may be due to lack of specialist equipment, drugs or lack of an incentive structure. Further, the system has lacked any penalties for lack of effort, or reward for exceptional effort (World Bank, 1991: xvii).

*Dukun* or traditional healers also play an important role in the health care of the population. In some rural areas these healers represent a treatment option of first resort, especially when there is no community health centre nearby, or if the only health care available is expensive. The manner of healing differs greatly among the hundreds of ethnic groups, but often these healers use extensive knowledge of herbal medicine and invoke supernatural legitimacy for their practice.

### *3.2.5 Health financing*

Indonesia's health care funds come from a variety of sources. The majority comes from government revenues, payments by patients, employer contributions to health care for employees, foreign loans and grants (WHO, 1985: 128; Brotowasisto et al., 1988: 131-140; World Bank, 1991: 10). In 1986/87, of the total government expenditure, about 36 per cent came from central government sources, 19 per cent came from provincial governments, 13 per cent from district governments, 21 per cent from state enterprises (mainly pharmaceutical companies), seven per cent from foreign aid and about five per cent from non-department health sources such as military hospitals (Hull and Hull, 1995: 120-148). Government expenditure on health is quite low by international standards. International Monetary Fund (IMF) figures (Table 3.5) indicate that only 2.6 percent of the national budget was spent on health in 1985, substantially smaller than other ASEAN countries with an average of 5.6 percent

Table 3.5 Comparative health expenditure ratios among ASEAN countries

| ASEAN Country | Year | As % of central government expenditure | As % of GDP | US$ per capita |
|---|---|---|---|---|
| Indonesia | 1985 | 2.56 | 0.56 | 3.37 |
| Malaysia | 1981 | 4.39 | 1.36 | 23.40 |
| Philippine | 1985 | 5.95 | 0.63 | 3.75 |
| Thailand | 1985 | 5.69 | 1.20 | 8.98 |
| Singapore | 1985 | 6.47 | 1.78 | 122.29 |

Source: World Bank 1991

(World Bank, 1991; Gunawan et. al., 1992; Corner and Rahardjo, 1995; Hull and Hull, 1995).

Table 3.5 shows that government expenditure on health is only 0.6 per cent of GDP in Indonesia compared to around 1.3 per cent in the region. The World Bank estimated that Indonesia's government expenditure effort is only about half of what would be expected based on the performance of neighboring countries (World Bank, 1991).

### *3.2.6 Family planning*

In the past government era, birth control was regarded as a threat to moral standards. President Sukarno was convinced that the main population problem was geographical maldistribution. As late as 1964, he was quoted as saying "My solution is to exploit more land, because if you exploit all the land in Indonesia you can feed 250 million, and I only have 103 million..... in my country, the more [children] the better" (Hull et al, 1977; Hull and Mantra, 1981: 262-284). In the Sukarno era, family planning was a taboo subject even among many academics. Birth control was seen as unnecessary and in the long run fertility would decline naturally as a result of economic development.

However in 1953 with no support from government, a small concerned group of private citizens began to promote family planning. The group's earlier efforts were limited to providing information about the aims and ideas of family planning, and inviting the opinions of community organisations and religious leaders. They also provided limited services through maternal and child health clinics. In 1957, these efforts culminated in an organisation, the Indonesian Planned Parenthood Association (IPPA) or *Perkumpulan Keluarga Berencana Indonesia* (PKBI) (Sujono, 1974; Utomo et al, 1983: 19-48; Streatfield, 1986: 42). The first national conference of IPPA was held in Jakarta in 1967 and was supported by government and major religious leaders (Hull and Mantra, 1981: 262-284).

In 1967, President Soeharto joined a group of world leaders in signing the UN Declaration on Population. This declaration officially recognised the basic human right to determine the number and spacing of children, and that population control is as an element of economic and social planning (Hull and Mantra, 1981: 262-284). Acting President, Soeharto, gave a speech on Independence Day, 16 August 1967 and made the following statement with respect to the population problem:

> Looking far into the future, we should courageously face the fact that the increase in the rate of population will not be in balance with the rate of available food supplies, whether produced at home or imported. We should, therefore, pay serious attention to the effort in birth control with the idea of planned parenthood which can be justified by the ethics of Religion and the ethics of *Pantjasila* [the five pillars or five principles on which the Republic of Indonesia is based: belief in God, nationalism, humanism, democracy, social justice]. This principle problem is related to the fate of our future generations. So it should be done thoroughly and according to plan.

In 1968, the President issued the decree instructing the Minister of Welfare to establish the National Family Planning Institute (NFPI) as a semi-governmental body to promote and coordinate family planning activities (Sujono, 1974; Utomo et al, 1983: 19-48). In the following year, the President issued a new decree assuming full responsibility, and the National Family Planning Institute was replaced by the National Family Planning Coordinating Board (NFPCB) or *Badan Koordinasi Keluarga Berencana National* (BKKBN) (Sujono, 1974; Hull and Mantra, 1981: 262-284).

The first study in 1967 conducted by a group of students and staff of the Social Science Department of the University of Indonesia, showed that the majority of the population in Jakarta wanted a family planning program. The second study was a KAP (knowledge-attitude-practice of family planning) survey and was conducted by the National Family Planning Coordinating Board (NFPCB, 1995).

The movement for population development was also supported by various non-government organisations (NGOs), such *as Perkumpulan Kontrasepsi Mantap Indonesia* (PKMI), *Forum Indonesia untuk Swadaya Kependudukan* (FISKA), *Gerakan Remaja Sehat* (GRS), Zero Population Growth (ZPG*)*, and *Yayasan Kusuma Buana* (YKB). Several socio-religious organisations have also given full support such as *Nachdatul Ulama* (NU), *Muhammadiyah, Majelis Ulama Indonesia* (MUI), *Persatuan Gereja Indonesia* (PGI), and *Konferensi Wali Gereja Indonesia* (KWI).

Table 3.6 Target and actual new users of the family planning program during the first long-term development, Indonesia 1969-94

| | | Total number of new contraceptive users | | Percentage |
|---|---|---|---|---|
| Pelita | Period | Target | Actual result | (actual/target) |
| Pelita I | 1969-74 | 3,025,000 | 3,201,458 | 105.8 |
| Pelita II | 1974-79 | 9,859,933 | 10,236,618 | 103.8 |
| Pelita III | 1979-84 | 14,661,553 | 17,379,592 | 118.5 |
| Pelita IV | 1984-89 | 25,745,874 | 24,679,010 | 95.9 |
| Pelita V | 1989-94 | 23,523,900 | 21,137,327 | 89.9 |
| Total | | 76,816,260 | 76,634,005 | 99.8 |

Source: NFPCB, 1995

During Pelita I, the government succeeded in recruiting 3.2 million new acceptors from Java and Bali provinces who were prepared to participate in a birth control program. During Pelita II, another 10.2 million acceptors were added from 16 provinces. During Pelita III (1979/80 - 1983/84) the scope of the Family Planning movement was expanded to cover all provinces (Utomo et al., 1983: 19-48). In this period, the government added 17.4 million new participants to its program from the target of 14.7 million. During Pelita IV, the government only succeeded in recruiting

Table 3.7 Percentage of new users of family planning program according to method of contraceptives during first long-term development

| Contraceptive method | Pelita I 1969-74 | Pelita II 1974-79 | Pelita III 1979-84 | Pelita IV 1984-89 | Pelita V 1989-94 | Total |
|---|---|---|---|---|---|---|
| Pill | 57.5 | 68.6 | 57.3 | 38.5 | 31.1 | 45.5 |
| IUD | 31.0 | 15.7 | 21.9 | 21.6 | 18.2 | 20.3 |
| Condom | 10.6 | 12.8 | 5.4 | 3.4 | 2.0 | 5.0 |
| Ob.Vag. | 1.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 |
| Injection | 0.0 | 1.6 | 13.2 | 32.9 | 38.1 | 24.3 |
| Med.Op. | 0.0 | 1.2 | 2.1 | 1.5 | 3.1 | 2.2 |
| Implant | 0.0 | 0.0 | 0.0 | 0.0 | 7.4 | 2.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: NFPCB, 1995

95.9 per cent (or 24.7 million) new participants from its target of 25.7 million. Furthermore, during Pelita V while the government had set a target of 23.5 million, it only succeeded in enlisting 21.1 million (or 89.9 per cent) new participants, Table 3.6 (NFPCB, 1995: 72).

The contraceptive preferences in the beginning of the program in 1969/70 varied: 54.7 percent IUDs, 27.5 per cent pills and 17.8 per cent condoms. During Pelita II and III, pills were favoured by most participants. The percentage was 68.6 per cent during Pelita II and 57.3 per cent in Pelita III. However, during Pelita IV the participants using pills went down to 38.5 per cent, due to the growing number of participants preferring birth control injections (Table 3.7).

## 3.3 Summary

There is no doubt that the family planning program has played an important role in reducing fertility rates since the early 1970s in Indonesia. Both fertility and mortality rates in Indonesia are still high in comparison with other nations especially neighbouring countries. The momentum of population growth, means that in the next decade, Indonesia will be populated by 220 million human beings with over half of them living in an already crowded Java.

Health expenditure is only 2.6 per cent of the national budget or only 0.6 per cent of GDP. Furthermore, health provisions do not reach all the people who are living in many remote islands.

Chapter Four discusses mortality levels and trends in Indonesia. Indirect estimation was employed to examine the trend of infant mortality since the 1960s. Estimates are based on the 1980 and 1990 Censuses and the 1985 and 1995 Intercensal Surveys that were recorded from CBS publications. The variation of the survival function of children during infancy among island groups and provinces is also examined in the next chapter.

# 4

# Levels and trends of infant and child mortality

## 4.1 Introduction

This chapter examines changes in the level and trend of infant and child mortality at the national, groups of islands, and provincial levels. Using available census and survey data sets, the level of infant and child mortality will be estimated and analysed by provinces. Combined direct and indirect techniques are used for estimating infant and child mortality. The data sources and level of infant and child mortality from recent colonial history will also be discussed in order to give a knowledge of the history of data collection and the level of infant mortality in Indonesia. Pre-revolutionary analysts estimated that the infant mortality rate was around 200 deaths per thousand births for the Indonesia as a whole, but they were unable to provide much detailed support for their arguments (Hull and Sunaryo, 1978).

During the last two-decades, various data and estimates have confirmed the declining trend in infant mortality in Indonesia. The rate of decline was 1.5 per cent per annum before the 1970s and increased to 3.2 and 3.5 per cent per annum during the period 1970-80 and the period 1980-90 (Soemantri, 1983; CBS, 1995b). The extent of infant and child mortality decline varied by provinces. Using the 1994 Indonesia Demographic and Health Survey (IDHS), this chapter examines the empirical survival distribution functions according to the different groups of islands, and by provinces within these groups of islands using life table techniques. Further examination of the socio-demographic differentials in survival probabilities will be discussed in Chapter Five.

## 4.2 Historical sources of information on infant and child mortality in Indonesia

Since 1911, there had been a system for registering deaths in Indonesia. However, the results are very poor in quality. In some larger cities, the data on the number of deaths were more reliable than in rural areas, because usually in urban areas an examination of death is required before a burial can commence. During the 1930s, the registration system was improved although this was limited to certain regions in Java (Nitisastro, 1970). During the 1940s, the registration system discontinued because of civil unrest. It resumed again in the 1950s (Timmer, 1961; Nitisastro, 1970).

Due to the community's life style, deaths are usually registered after a certain time has passed or not at all. Even though a death certificate is essential from the local government in order to obtain a burial permit, many deaths remain unreported, especially those of infants and children (Timmer, 1961). According to the system, the village administrator recorded deaths in triplicate. The first copy was given to the informant, the second copy was retained by the village, and the third copy was forwarded to the local health officer (Nitisastro, 1970). The local health officer reported the results quarterly to the statistical division of the Department of Health. However, estimating infant mortality rates are not only dependent on the number of infant deaths, but also on the number of births. To the extent that the information on births is deficient at that time, the computation of the infant mortality rate may be inaccurate, even if there is a very accurate registration of infant deaths. In general, birth registration in Indonesia has been less complete tha death registration.

Quinquennial censuses were conducted in Indonesia between 1880 and 1905 by the Colonial government. The data were almost exclusive to Java. In 1909, the Dutch colonial government decided to conduct "a general enumeration of the population and their horses, livestock, vehicles, ships and other vessels". This was supposed to start in 1915 and every ten years thereafter. However, probably because of the war in Europe, this decision was not implemented until 1920. (Nitisastro, 1970; Gardiner, 1981).

In February 1920, the first statistical office was established by the director of agriculture handicraft and trade, and Bogor was the headquarters (CBS, 1995b). In 1920, another ordinance stipulated that the census be conducted that year, but no reference was made for periodic censuses. The 1920 census was a "de jure" count and the topics included name, sex, marital status, whether children or adults, ethnic group, daily language used, literacy, ability to read and write in Dutch, physical disabilities and housing. The other Indonesian islands were accorded only limited coverage in the 1920 census. In September 1924, the colonial government changed the name of the body which collected statistical data and it became the *Centraal Kantoor voor de Statistiek* (CKS) or Central Office of Statistics, and the headquarters moved to Batavia (Jakarta) (CBS, 1995b).

The 1930 Population Census incorporated a number of improvements. The census was conducted throughout the entire country, although simpler methods of enumeration were applied in extensive areas outside Java (Nitisastro, 1970; CBS, 1995b). The census legislation stipulated that population censuses were to be held every ten years from 1930, and that the "de facto" population was to be enumerated, although in the islands outside of Java there was to be a "de jure" count. However, there was no census conducted in 1940 due to the depression of the thirties which had a major effect on the Indonesian economy (Nitisastro, 1970). The Second World War, the revolution and the establishment of the new country prevented the conduct of a census in the 1940s and 1950s.

The first population census in Indonesia was conducted on 31 October 1961 (fifteen years after the proclamation of independence in 1945) by the Central Bureau of Statistics (CBS). The census covered the whole area of the Republic of Indonesia except West Irian which was still occupied by Dutch forces (CBS, 1995b). In the 1961 census, for the first time, villages were classified into urban and rural areas and divided into enumeration units which were called "Primary Sampling Units (PSU)".

The PSU was an area that had fixed borders and contained 75 to 100 households (CBS, 1995b). With the first modern census in 1961, it was possible to utilise "indirect" techniques for calculating life table mortality rates from data that included children ever born and still living, according to the mother's age (Hull and Sunaryo, 1978).

The second census after independence was conducted in 1971. This census covered 25 provinces of Indonesia and urban Irian Jaya. The methods used in this census were the same as the 1961 census, however, the quality of the 1971 census was better than in 1961 and therefore the results were used as the *benchmark* of social and population statistical data. For this reason, the analysis of recent mortality in Indonesia starts properly with the 1971 data (Hull and Sunaryo, 1978). In the 1980 census, the questionnaire was revised from the 1971 census but the field methods were still the same as the previous census. For the first time, enumeration areas (*wilcah*) were introduced in the census. *Wilcah* is an area which has fixed boundaries and consists of 300 households. Each *wilcah* is divided into three or four census blocks. The last census was conducted in 1990 using better methodology. In the 1990 census, census blocks were no longer used, however the *wilcahs* continued to be used as the smallest enumeration area.

Beside vital registration and censuses the other data source used for measuring infant and child mortality is the sample survey. The object of the sampling procedure is to secure a sample which, subject to limitation of size, will reproduce the characteristics of the population, especially those of immediate interest, as closely as possible (Yates, 1981).

During the 1950s, there were studies on the health conditions in Jakarta. The areas included in these studies were comprised of *Kecamatan Senen* and *Salemba*. The sample households supplied information on past births and deaths. In the period of 1935-37, Liem Tjay Tie and de Haas conducted a survey in Tasikmalaya. The area studied consisted of five out of thirty-three subdistricts of the regency of Tasikmalaya. In the late 1960s, the CBS conducted the National Social Economic Survey (*Susenas*) and included some questions from which indirect estimates could be made. However the quality of the *Susenas* data was frequently criticised because of methodology, sampling frame and sampling size problems (Hull and Sunaryo, 1978).

In the 1970s, there were two surveys used as major data sources to estimate infant and child mortality. They used both direct and indirect techniques. The 1973 Fertility and Mortality Survey (FMS) was conducted by the Demographic Institute, Faculty of Economics, University of Indonesia. It covered 54,214 households in Java (excluding Jakarta), Sumatra, Sulawesi and Bali, which together contained 86 per cent of Indonesia's population. In addition, the 1976 World Fertility Survey (WFS) conducted by the Central Bureau of Statistics covered Java and Bali. The 1976 WFS is also known as Indonesia's intercensal survey phase III (Supas III).

In 1987, CBS conducted the National Indonesia Contraceptive Prevalence Survey (NICPS). This was part of the international program in which similar surveys were conducted in developing countries in Asia, Africa and Latin America. The other surveys were the 1991 and 1994 Indonesia Demographic and Health Surveys. These surveys are the main data sources used in this thesis. A detailed explanation of these surveys was provided in Chapter Two.

## 4.3 Earlier mortality estimates

### *4.3.1 Mortality prior to the 1961 Census*

Infant mortality was extremely high during the period preceding Second World War. A number of these estimates are presented in Table 4.1 where it can been seen that the regions studied were usually small and urban. Further, some of the information was based on the registration of births and deaths. Estimates of crude death rates for this period vary greatly from 28 to 35 per thousand persons, implying a life expectancy at birth of 30 to 35 years. The infant mortality estimates, based on the 1930 census, were very crude because the estimated number of births was based on the data of "children who cannot yet walk". Researchers have various interpretation of these data. Children who cannot yet walk maybe children aged less than one year, aged less than fifteen months, or aged less than eighteen months. If it was assumed that "children who could not yet walk" were all less than fifteen months, then the number of children aged less than one year was four-fifths of the total of "children who could not yet walk". Or if it was assumed that all "children who could not yet walk" were less than eighteen months old, then the number of children aged less than one year was two-thirds of the total. Therefore the infant mortality rate, based on the 1930 Census, varies depending on the assumption used.

Using the 1930 census, Brand cited in Nitisastro (1970), estimated that the infant mortality rate for Jakarta was between 176 to 294 per thousand births. On the other hand, Van Gelderen and Keyfitz estimated the rate to be 200 per thousand births for national levels. A number of studies on infant mortality in Jakarta have been conducted, one of them by Walch-Sorgdrager in Budi Kemuliaan Hospital Jakarta during 1929. He estimated that the infant mortality rate was 231 per 1,000 births. This was a special study of infant mortality, which there was a perfect matching between births and deaths. De Haas carried out another study in Jakarta in 1934-37. He found that in each year the infant mortality rate was around 300 per thousand of births. This estimate seems too high due to his low estimate of the number of births. Although most studies of infant mortality in Indonesia were conducted in urban areas, Liem Tjay and de Haas carried out a study in the rural area of Tasikmalaya in 1934-37. They estimated that infant mortality rates ranged from 225 to 250 per thousand births (Nitisastro, 1970).

Brand cited in Nitisastro (1970) computed the infant mortality in the town of Bandung during the 1930s, which reputedly maintained a good register of its Indonesian inhabitants. Infant mortality rates were estimated to be between 143-149 per thousand births. Based on the registration data, the infant mortality rates in Yogyakarta were estimated to be 243 and 278 per thousand births for 1933 and 1934 (Timmer, 1961).

Almost no data on vital statistics exist for the other Indonesian islands except for plantation residents on the east coast of Sumatra. A number of doctors connected

Table 4.1 Estimates of infant mortality rate according to method of estimation and source of data, Indonesia, 1926-58

| Author | Data source | Reference period | Coverage | IMR |
|---|---|---|---|---|
| M. Straub (1927) | Registration | 1926 | East coast of Sumatra | 160-370 |
| Walch & Sorgdrager (1931) | Case study | 1929 | Jakarta | 231 |
| W. Brand (1940) | 1930 Census | 1929 | Jakarta | 176-294 |
| Van Gelderen (1931) | 1930 Census | NS | Indonesia | 200 |
| Keyfitz (1953) | 1930 Census | NS | Indonesia | 200 |
| W. Brand (1958) | Registration | 1931-38 | Bandung | 143-149 |
| Timmer (1961) | Registration | 1931-32 | Medan | 142 |
| Timmer (1961) | Registration | 1933 | Yogyakarta | 243 |
| Timmer (1961) | Registration | 1934 | Yogyakarta | 278 |
| De Hass (1939) | Case study | 1934-37 | Jakarta | 300 |
| Liem & De Haas | Case study | 1935-37 | Tasikmalaya | 180 |
| De Hass (1939) | Case study | 1936 | Purwokerto | 100 |
| De Hass (1939) | Case study | 1936 | Madiun | 200 |
| Timmer (1961) | Registration | 1938-39 | Medan | 170 |
| Tesch (1948) | Hospital | 1938-40 | Jakarta | 211 |
| Timmer (1961) | Registration | 1938-40 | Jakarta | 206-209 |
| Timmer (1961) | Registration | 1952-56 | Wonosobo | 161-194 |
| Nitisastro (1970) | Registration | 1958 | Jakarta | 171 |
| Nitisastro (1970) | Registration | 1958 | Surabaya | 178 |
| Nitisastro (1970) | Registration | 1958 | Surabaya | 148 |

Source: Various sources
Note: NS - Not stated

with this program compiled and published vital statistics on plantation laborers and their families. In 1926, in two plantation areas, M. Straub reported crude birth rates of 46.8 and 41.9 per 1,000 persons. The crude death rate was reported to be 26 or 27 per 1,000 person, while the infant mortality ranged from 160 to 370 per thousand births in various plantation areas.

Timmer stated that in 1952 the estimates of infant mortality rates for Indonesia were all above 130 per thousand live births. The estimates of infant mortality in the Wonosobo regency of Central Java, which had satisfactory vital registration data varied between 161-194 per thousand live births during the period 1952-56 (Timmer, 1961: 138). In 1958, the highest infant mortality rates are those of Jakarta (171) Surabaya (178) and Wonosobo (148).

### *4.3.2 Mortality after the 1961 Census*

Estimates of mortality after the 1961 Census were expected to be more reliable than those before the 1961 Census. Table 4.1 shows the estimates of infant mortality based on several data sources and estimated by various researchers. All such estimates refer not to the mortality at the date of the survey or census, but to that experienced a few years previous to the enumeration. Data on infant and child mortality in Indonesia since 1961 are almost invariably based on indirect estimation techniques (Utomo and Iskandar, 1989).

Suhartono and Suardi (1970) using *Susenas* data estimated that the infant mortality rate for Indonesia was 188 and 167 per thousand births for males and females respectively. However, Sastrasuanda (1971), using the same data set has lower estimate than those of Suhartono and Suardi, 142 per thousand births for both sexes. The mortality estimates obtained from *Susenas* never received a great deal of attention among demographers due to the unreliability of the data (Hull and Sunaryo, 1978).

Based on the 1971 Census, McNicoll and Mamas (1973), Cho et al., (1976), Hull and Sunaryo (1978), Soemantri (1983), and CBS (1993a) estimated that infant mortality in Indonesia ranged from 133 to 145 per thousand births. These researchers employed the same method (Brass and Trussell) and model (West model). However, their time references were slightly different.

Using indirect methods, some researchers estimated that infant mortality for Java ranged between 109 to 114 based on the 1976 intercensal data. Estimates of infant mortality for Indonesia, based on child survivorship data from the 1980 Census, give values of 113, 86 and 107 per thousand births for rural, urban and total areas respectively. These values are higher than the respective levels of infant mortality estimated from the last live birth data, 97 per thousand live births (Dasvarma, 1983: 154).

Table 4.2 Estimates of infant mortality rate according to method of estimation and source of data Indonesia, 1960-91

| Author | Method of estimation | Data source | Reference period | Coverage | IMR |
|---|---|---|---|---|---|
| Sastrasuanda (1971) | unknown | Susenas | 1964 | Indonesia | 142 |
| Suhartono and Suardi (1970) | unknown | Susenas | 1964 | Indonesia | 188 M<br>167 F |
| McNicoll & Mamas(1973) | Brass (West) | 1971 Census | 1960-67 | Indonesia | 133 |
| Cho et al. (1976) | Brass (West) | 1971 Census | late 60s | Indonesia | 144 |
| McDonald et al.(1976) | Brass (West) | 1973 IFMS | late 60s | Java | 140 |
| Sunaryo (1978) | Brass (South) | 1971 Census | late 60s | Indonesia | 131 |
| Soemantri (1983) | Trussel (West) | 1971 Census | 1968 | Indonesia | 143 |
| Hull & Sunaryo (1978) | Trussell (West) | 1971 Census | 1968 | Indonesia | 143 |
| BPS (1993) | Trussel (west) | 1971 Census | 1969 | Indonesia | 145 |
| Hull & Sunaryo (1978) | Sullivan (West) | 1973 IFMS | 1969 | Java | 140 |
| Sunaryo et al. | Brass (South) | 1976 Intercensal | 1973 | Java | 109 |
| Kasto & Sunaryo (1978) | Feeney | 1976 Intercensal | 1973 | Java | 105 |
| Hull & Sunaryo (1978) | Trussell (West) | 1976 Intersencal | 1973 | Java | 112 |
| Hull & Sunaryo (1978) | Brass (using last life birth data) | 1976 Intercensal | 1975 | Java | 114 |
| CBS (1993) | Trussel (west) | 1980 Census | 1976 | Indonesia | 109 |
| Soemantri (1983) | Trussel (West) | 1980 Census | 1977 | Indonesia | 107 |
| Dasvarma (1983) | Brass (using last life birth data) | 1980 Census | 1979 | Indonesia | 97 |
| CBS (1982) | Trussel (west) | 1980 Census | 1978 | Indonesia | 98 |
| CBS (1989) | Direct estimate | 1987 NICPS | 1977-87 | Indonesia | 75 |
| CBS (1992) | Direct estimate | 1991 IDHS | 1981-91 | Indonesia | 74 |
| CBS (1993) | Trussel (west) | 1990 Census | 1986 | Indonesia | 71 |
| CBS (1995) | Direct estimate | 1994 IDHS | 1984-94 | Indonesia | 66 |
| CBS (1997) | Trussel (west) | 1995 Intercensal | 1991 | Indonesia | 51 |

Source: Various sources

McDonald et al., (1976) applying the birth cohort survival method to the 1973 Fertility Mortality Survey estimated the under five mortality in selected provinces and islands in Indonesia between 1945-49 and 1965-67. The result shows a declining IMR throughout the period among provinces in Java, Sumatra and Sulawesi in both urban and rural areas. According to their estimates, mortality rates under five years of life between 1945-49 and 1965-67 periods declined from 228 and 229 to 108 and 136 per thousand births in East Java and West Java respectively (McDonald et al., 1976: 69).

Kadarusman (1982) applied the birth cohort survival method when using the 1976 Indonesia Fertility Survey. The results also show a consistent decline in child morality in all the provinces of Java (Kadarusman, 1982). However, the under five mortality rate was estimated by Kadarusman to be slightly higher than those estimated by McDonald et al., one uses 1973 Fertility Mortality Survey, the other uses 1976 World Fertility Survey. McNicoll and Mamas, using the 1961 census, estimated the under five mortality rate to be quiet high, Jakarta 263, East Java 245, and Yogyakarta 207 per 1,000 live births.

From Table 4.2 it can be concluded that based on the various data and using various methods, that infant mortality in Indonesia declined considerably between the 1960s and early 1990s. Many factors affected the decline of infant mortality in Indonesia, especially health development, the improved socio-economic conditions of the people and the improved community facilities.

### 4.4 Mortality trends

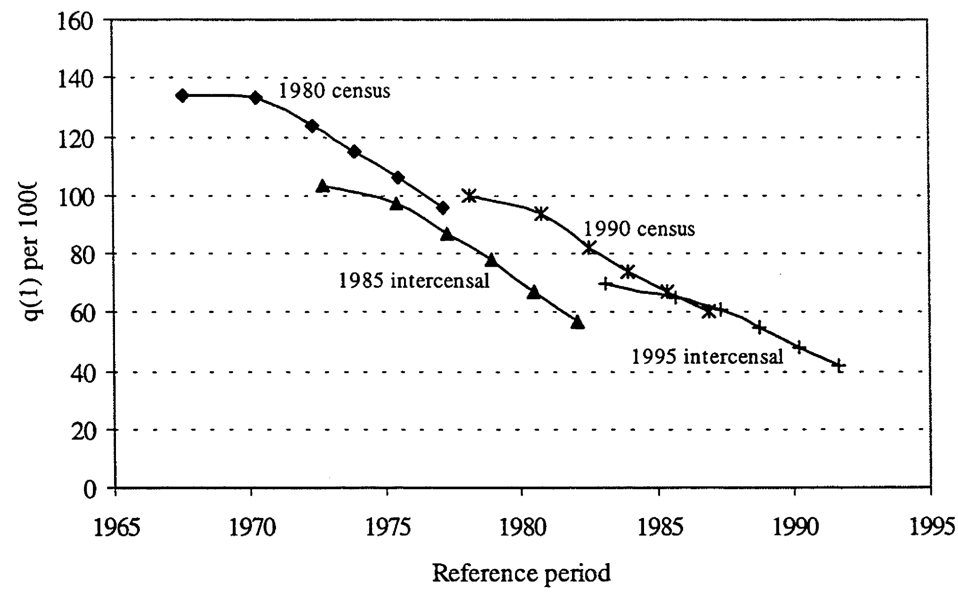
Over the last decade estimates of Indonesia's mortality rate have generally been based on intercensal survivorship techniques, or the Brass method of converting proportions of children deceased by age of mother into estimates of proportions dying ($_xq_0$) by various childhood ages. Model life tables play a crucial role in the estimation of childhood mortality. The choice of an appropriate mortality model becomes a key step in the estimation of infant and child mortality rates. Generally, researchers applied the "West" model or the "General" model for United Nations life tables for the Indonesian data in the absence of evidence strongly supporting an alternative choice.

The issue of appropriateness of using family model life tables to describe the Indonesia mortality pattern was debated in the 1970s (Hull et al., 1981). McDonald (1978), using the 1973 Fertility and Mortality Survey, and Gardiner (1978), using the Indonesia Sample Registration Project, found that Indonesia's mortality pattern is much closer to the West pattern than any others. However, Sinquifield and Kartoyo have suggested applying the South family model, based on their analysis of the 1973 Indonesia Fertility Mortality Survey. This would have the effect of a higher life expectancy at birth for a given level of infant mortality than would be the case under the West model (Sinquifield and Kartoyo, 1977). McDonald (1978) challenged this view claiming that the adult mortality rates in Indonesia like Malaysia, are higher than the levels implied by the regional model life tables, based on estimates of mortality at younger ages (McDonald, 1978: 7). In addition, Hull and collegues (1995) summarised the guidance contained in most demographic manuals, "When in doubt, choose West" (Hull et al., 1995: 18).

The relationship between the proportion dead and the life-table probability of dying is sensitive to the age pattern of mortality in the first year or two of life. Figure 4.1 shows estimates of $q_{(1)}$ plotted against their reference period points. The estimates are based on data from two successive censuses and two intercensal surveys. The estimates employed Coale-Demeny model life table analysis. It seems that the infant mortality rates implied by the 1985 Intercensal Survey were under estimated. Figure 4.2 proved that the proportion dead in the 1985 Intercensal Survey was under estimated in all age groups of women when compared to the 1980 and 1990 Censuses and the 1995 Intercensal Survey.

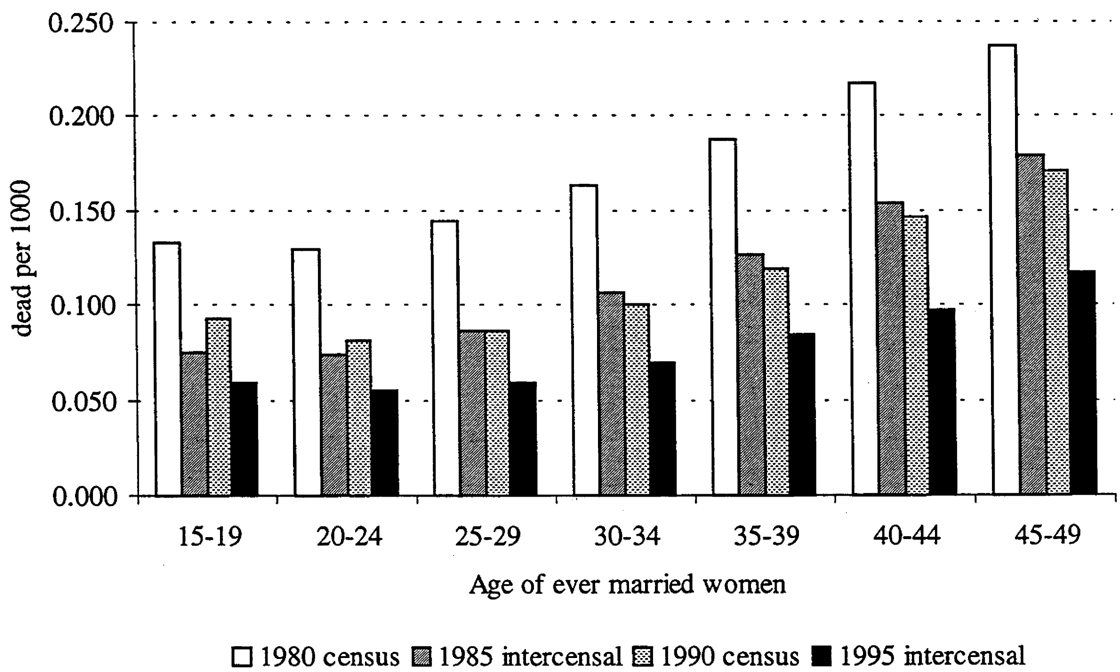
The infant mortality trends, using various data sources, show the decline in infant mortality in the past three decades (Figure 4.1). The 1980 Census shows the trend of infant mortality from the late sixties to the late seventies. In the late sixties, there was no indication of declining infant mortality. However, during the seventies, the infant mortality rate declined considerably, from 133 to 96 per thousand births. During the 1980s and early 1990s there were further declines in infant mortality, from 94 per thousand births in 1981 to 60 per thousand births in 1987, and to 42 in 1992 (1990 Census and 1995 Intercensal Survey).

Figure 4.1 Indirect estimates of infant mortality $q_{(1)}$ using the Coale-Demeny West Model, based on the 1980, 1990 Censuses, and the 1985, 1995 Intercensal Surveys




Sources: Table A.4.1

Figure 4.2 Proportion dead, based on the 1980, 1990 Censuses and the 1985, 1995 Intercensal Surveys




Sources: Table A.4.2

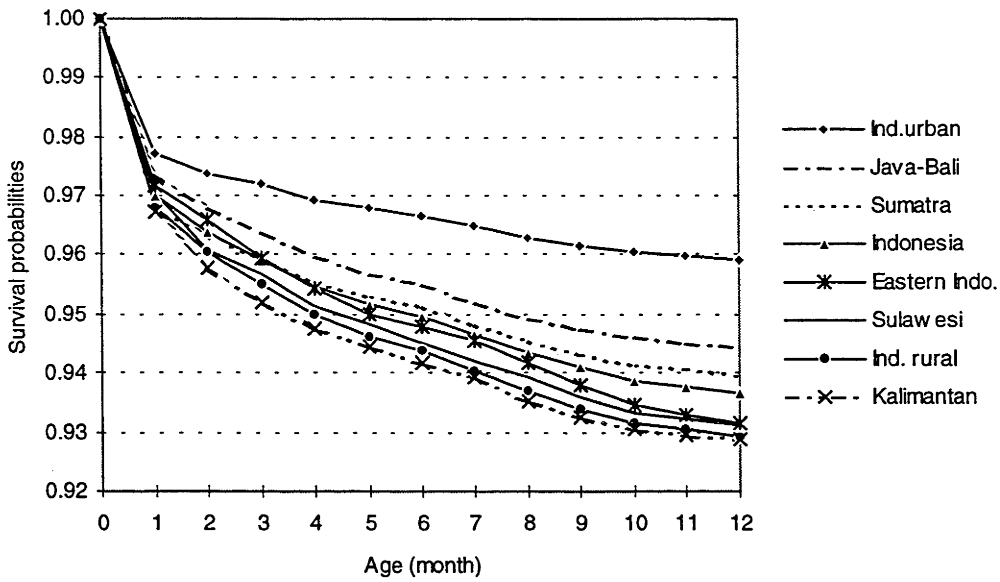
## 4.5 Survival function during infancy

Survival time or the length of time from birth to death is the main variable analysed in this chapter. The monthly analysis requires the monthly age of dead children. Unfortunately the monthly age of child death is only available until the age of 24 months. Afterwards the age of the dead child is available only in years, not months. According to the data available, the survival method applied in this chapter is only for children under the age of one.

Selectivity and censoring are two types of biases that can occur in survival time analysis. Data on babies born to women who already died before the survey are not available. To get an ideal analysis of mortality in the recent past, the mortality of children born just prior to the survey should be used. However, this would result in a small sample size. Therefore in this chapter the analysis is extended to births 10 years prior to the survey.

Figure 4.3 shows the survival function for the five groups of islands compared with the average of Indonesia's urban and rural areas. As expected among the five groups, Java and Bali had the highest probability of surviving, perhaps due to the fact that Java and Bali are the most developed regions of Indonesia. Furthermore, Kalimantan had the lowest survival function during infancy among the group of islands, and was the only island group that showed a lower survival function than that of rural-Indonesia. Interestingly, children in the initial months (up to three months) of life, in Eastern-Indonesia had a higher probability of surviving than for Indonesia overall, but by 12 months, the probability of surviving was slightly below that of Sulawesi. On the contrary, the probability of surviving in Sumatra in the initial months was lower than that of Indonesia as a whole, and then became higher after the infant reached the age of three months.

Figure 4.3 Survival function among groups of islands and Indonesia urban/rural 1994 IDHS




Source: Table A.4.3, A.4.4

Figure 4.4 shows the probability of surviving for children in the first year of life among provinces in island groups compared to all of Indonesia's urban and rural areas. Because Sumatra has eight provinces, in the presentation of the graph, Sumatra is divided into two groups, namely Sumatra I and Sumatra II in order to easily differentiate the survival functions between the provinces.

The figures presented in each group of islands are in the same scales, in order to compare the infant survival functions between provinces in each island or within islands. With regard to each island group, the survival function graph of children during infancy illustrates the difference between the provincial and national level. A detailed explanation of the determinants of the survival function differentials of children during the first year of life between provinces in islands and between provinces in Indonesia is discussed in Chapter Seven.

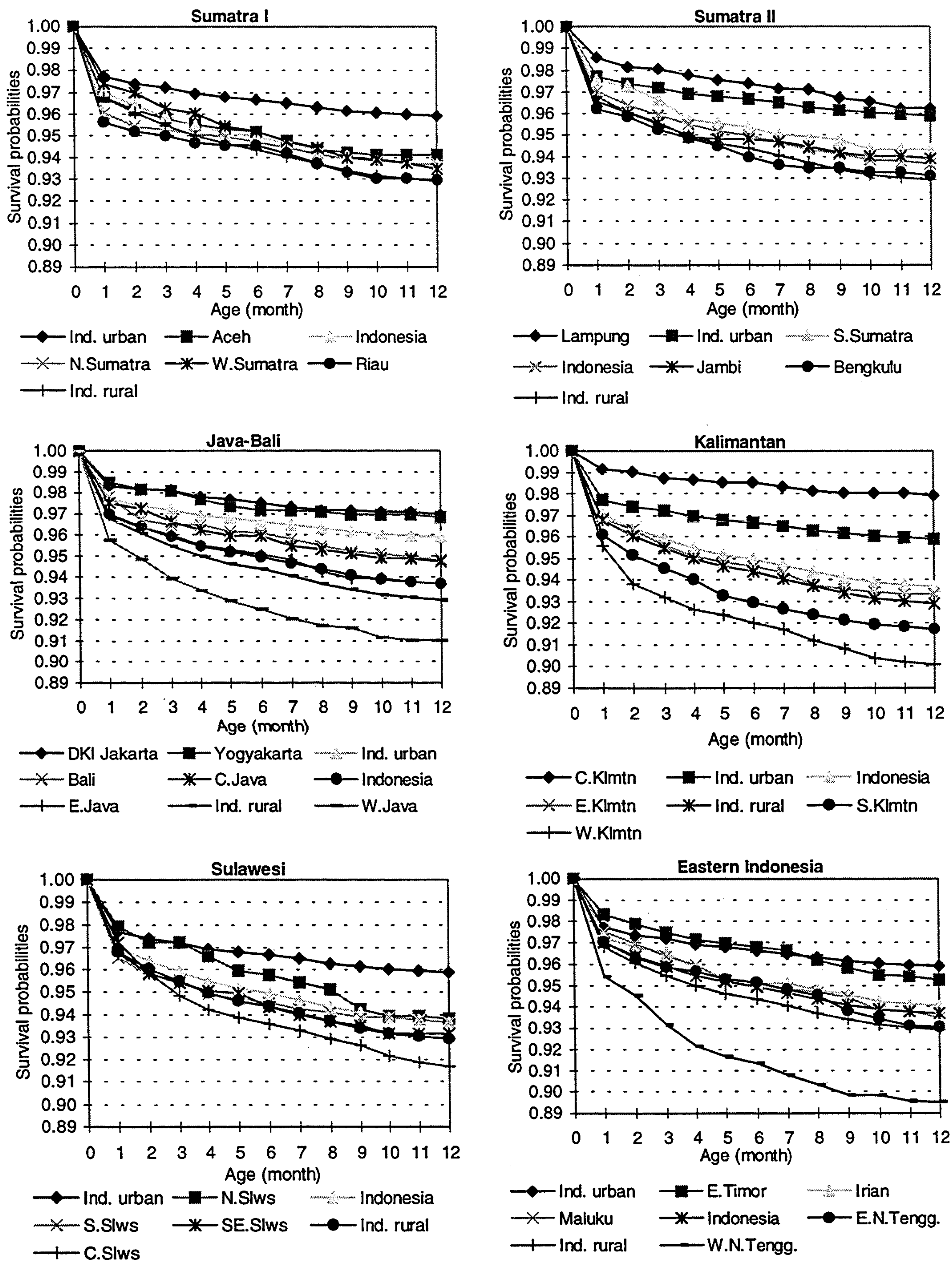
Children who live in Lampung province had the highest probability of surviving during the first year of life compared to children who lived in other provinces of Sumatra. The level is even higher than the urban Indonesian average. This may be because Lampung is as an entry gate to Sumatra from Java and Lampung is also known as the destination of the first transmigration from Java. Therefore the culture of the Lampung population is mostly identical to the Javanese. On the other hand, children who live in Bengkulu and Riau provinces had the lowest survival functions of Sumatra's children in their first year of life, and the levels are congruent with the rural-Indonesia average.

There are so many factors affecting the survival function differentials during a child's first year of life. The extent of tetanus immunisation of pregnant women is a significant factor. Health Provincial Offices' data show that in 1992 in Lampung 70 per cent of pregnant women were immunised, while in Bengkulu and Riau 39 and 55 per cent were immunised (MOH, 1994a). Survival function levels of children of West Sumatra, North Sumatra and Jambi were the same as the Indonesian average. Those from Aceh and South Sumatra had slightly higher levels than those of the Indonesian average.

Children who live in Jakarta and Yogyakarta had the highest probability of surviving during their first year of life than those who live in other provinces in Java and Bali. The figures were above the average of urban-Indonesia. Children who live in West Java province had the lowest probability of surviving among the provinces of Java and Bali, and the level was below the average for rural-Indonesia. The probability of surviving in Central Java and Bali provinces was above the Indonesian average. The probability of surviving for East Java's children was the same as the national average. Predictably those children who live in Jakarta had the highest survival function during the first year of life because Jakarta is the capital city, it has the best health services, and the socio-economic status of the people is above the Indonesian average.

Children in Central Kalimantan not only have the highest probability of surviving during the first year of life among provinces in Kalimantan islands but also among all the provinces in Indonesia. Children in West Kalimantan had the lowest survival probability during their first year of life. The survival function of children during the first year of life in South Kalimantan and West Kalimantan was below the

Figure 4.4 Survival function in the first year of life among children according to provinces in group of islands in Indonesia, 1994 IDHS




Source: Table A.4.4 to A.4.9

average of rural-Indonesia, while in East Kalimantan the slope was congruent with the average of rural-Indonesia.

Among provinces in the island of Sulawesi, children from Central Sulawesi had the lowest probability of surviving before they reached their first birthday; the level was below the rural-Indonesian average. Children from North Sulawesi had the highest probability of surviving until they reached eight months old, but from nine months up to one year; their probability of surviving was the same as that of children from South Sulawesi and the Indonesian average. Furthermore, children of South-east Sulawesi had the same survival level as those of rural-Indonesia.

The development in many sectors in the eastern Indonesian provinces remains far behind the average especially when compared with Java and Sumatra (Jones, 1995). Surprisingly, among the Eastern Indonesia islands, children from East Timor had the highest probability of surviving during the first year of life; the level slightly below the urban Indonesian average. Children from West Nusa Tenggara had the lowest level of survival during infancy; the level was far below the average of rural Indonesia. Irian Jaya and Maluku's children had survival levels the same as the Indonesian average.

### 4.6 Variation of infant mortality among provinces

The infant mortality rate in the 1980s ranged from 35 per 1,000 in the capital district of Jakarta to 123 in Nusa Tenggara Barat. The national average for infant mortality in urban areas was 52, and in rural areas, 78 per thousand births.

Based on the 1980 Census, IMR varies substantially between provinces, with the main contrasting figures being for the two provinces of Yogyakarta and West Nusa Tenggara with IMRs of 62 and 187 per 1,000 births respectively. Soemantri (1983) using the Trussell West model estimated that infant mortality per province ranged from 98 per thousand live births in Yogyakarta to 219 in West Nusa Tenggara

Table 4.3 The infant mortality rates in Indonesian provinces, 1971-90

| | Infant Mortality | | | | Annual decline % | |
|---|---|---|---|---|---|---|
| Province | 1971 | 1980 | 1990 | 1995 | 1971-80 | 1980-90 |
| Aceh | 143 | 93 | 58 | 31 | 4.1 | 3.8 |
| North Sumatra | 121 | 89 | 61 | 45 | 3.1 | 3.1 |
| West Sumatra | 152 | 121 | 74 | 60 | 2.4 | 3.9 |
| Riau | 146 | 110 | 65 | 39 | 2.9 | 4.1 |
| Jambi | 154 | 121 | 74 | 45 | 2.5 | 3.9 |
| South Sumatra | 155 | 102 | 71 | 54 | 4.0 | 3.0 |
| Bengkulu | 167 | 111 | 69 | 60 | 3.9 | 3.8 |
| Lampung | 146 | 99 | 69 | 48 | 3.8 | 3.0 |
| DKI Jakarta | 129 | 82 | 40 | 22 | 4.3 | 5.1 |
| West Java | 167 | 134 | 90 | 56 | 2.3 | 3.3 |
| Central Java | 144 | 99 | 65 | 39 | 3.7 | 3.4 |
| Yogyakarta | 102 | 62 | 42 | 23 | 4.6 | 3.2 |
| East Java | 120 | 97 | 64 | 56 | 2.3 | 3.4 |
| Bali | 130 | 92 | 51 | 34 | 3.4 | 4.5 |
| West Nusa Tenggara | 221 | 189 | 145 | 101 | 1.7 | 2.3 |
| East Nusa Tenggara | 154 | 128 | 77 | 59 | 2.0 | 4.0 |
| East Timor | n.a. | n.a. | 85 | 73 | n.a. | n.a. |
| West Kalimantan | 144 | 119 | 81 | 57 | 2.0 | 3.2 |
| Central Kalimantan | 129 | 100 | 58 | 34 | 2.6 | 4.2 |
| South Kalimantan | 165 | 123 | 91 | 78 | 3.0 | 2.6 |
| East Kalimantan | 104 | 100 | 58 | 46 | 0.5 | 4.2 |
| North Sulawesi | 114 | 93 | 63 | 41 | 2.2 | 3.2 |
| Central Sulawesi | 150 | 130 | 92 | 72 | 1.6 | 2.9 |
| South Sulawesi | 161 | 111 | 70 | 56 | 3.7 | 3.7 |
| Southeast Sulawesi | 167 | 116 | 77 | 55 | 3.6 | 3.4 |
| Maluku | 143 | 123 | 76 | 58 | 1.6 | 3.8 |
| Irian Jaya | 86* | 105 | 80 | 58 | n.a. | 2.4 |
| Indonesia | 145 | 109 | 71 | 51 | 2.9 | 3.5 |

Source: CBS, 1993a, 1997

Note : Reference period for the four data sources are 1967, 1976, 1986 and 1991
Calculated by Trusell (West) Methods.
n.a. = Not available
* 1971 Urban area

using the 1971 Census. Using the 1980 Census, the infant mortality rate ranged from 62 to 187 per thousand in Yogyakarta and West Nusa Tenggara respectively.

It is not surprising that the infant mortality rate differs widely between provinces and regions in Indonesia, due to the large area of the country and the geographical spread. Table 4.3 shows the trend and the annual decline of infant mortality in each province. The information was obtained by indirect estimates of infant mortality derived from the reports of women aged 20-24 using four data sources, the 1971, 1980 and 1990 Censuses and the 1995 Intercensal Survey.

The range of infant mortality among provinces in Indonesia in 1971 was between 102 infant deaths per thousand live births for Yogyakarta to 221 infant death per thousands live births for West Nusa Tenggara. In 1990, the IMR estimates ranged from 40 for DKI Jakarta to 145 for West Nusa Tenggara. In 1971, the provinces in Sumatra had almost the same IMR level, while provinces in Java had the lowest level of infant mortality, except for the West Java province. Provinces in Sulawesi had high infant mortality except for North Sulawesi, while the rates of infant mortality varied in Kalimantan provinces.

By 1980 infant mortality had declined considerably in all provinces. Yogyakarta and West Nusa Tenggara still had the lowest and the highest mortality rates among provinces. By 1990 West Nusa Tenggara was the only province which had an infant mortality rate above 100 deaths per thousand live births.

There are so many factors that affect the level of mortality among provinces, such as cultural background and variation in social and economic development. Why does mortality in West Nusa Tenggara remain high? Using qualitative research, Hull et al., (1995) found that mothers in Lombok (West Nusa Tenggara) were quiet open and uninhibited about reporting the death of their babies, while women in other province found it unsettling to mention dead babies. Thus it is possible that infant mortality in other provinces is under estimated relative to West Nusa Tenggara (Hull, et al., 1995: 7).

The annual declines of IMR during the 1971-80 period were most impressive in Yogyakarta (4.6 per cent), Aceh (4.1 per cent) and South Sumatra (4.0 per cent). On the other hand several provinces in the eastern part of Indonesia had an annual rate of decline of less than 2 per cent, namely, East Kalimantan (0.5 per cent), Central Sulawesi and Maluku (1.6 per cent) and West Nusa Tenggara (1.7 per cent).

The annual decline in the period 1980-90 nationally was higher than in the period 1971-80, from 2.9 per cent to 3.5 per cent per year. Fifteen provinces had an increase in the annual reduction, seven provinces had decreases in the annual reduction and two provinces remained constant in the annual reduction.

East Kalimantan had the highest change in annual reduction, from 0.5 per cent per year in the 1971-80 period to 4.2 per cent per year in the period 1980-90. DKI Jakarta has the highest annual decline in the infant mortality rate (5.1 per cent), while West Nusa Tenggara had the lowest reduction per annum (2.3 per annum).

## 4.7 Summary

Data sources for estimating infant and child mortality in Indonesia have been available since the colonial era, even though the quality and the coverage was limited in that area. The main data sources for estimating infant and child mortality in Indonesia are still the surveys and censuses as the vital registration data is unreliable.

Many researchers have analysed infant and child mortality in Indonesia using various data sources. Due to limited information, most researchers have applied indirect methods to estimate infant and child mortality in Indonesia. The results show that infant mortality in Indonesia has been declining sharply since the late 1960s. The disparity in levels of infant mortality and the survival function of children during infancy between provinces and groups of islands in Indonesia are very great. However, some provinces have unrealistic survival functions of children during the first year of life due to the small sample available in the 1994 IDHS. Chapter Seven examines the determinants of the differential in the survival function of infant mortality.

# 5

# Survival function and level of infant and child mortality by socio-demographic factors

## 5.1 Introduction

This chapter measures the differences in infant and childhood mortality caused by differences in the demographic and socio-economic status of parents or families. The main objective of this study is to estimate the empirical survival distribution function and the level of infant and child mortality by means of life table techniques. Univariate and bivariate analyses identify the significant variables which affect infant and child mortality.

## 5.2 Sex of the child and birth cohort

In many societies mortality among infants differs markedly according to the sex of the child. The biological survival superiority of the female infant is well substantiated in the findings of several researchers (Waldron, 1983: 141). One factor which may contribute to the higher mortality for males, is that, on the average, male babies appear to be less mature than female babies, even though they have a birthweight advantage. For example, it appears that, for a given gestational age, the lungs of male babies may be less mature than the lungs of females babies, and this probably contributes to the greater vulnerability of male babies to respiratory distress (Torday et al., 1981: 205-208).

This pattern is reversed in countries of South Asia. Female mortality exceeds male mortality shortly after birth and the pattern is often sustained throughout the childbearing ages. Excessive female mortality is a socially determined feature as male

Table 5.1 Infant and child mortality rates according to sex and birth cohort of the child, Indonesia 1979-94, 1994 IDHS

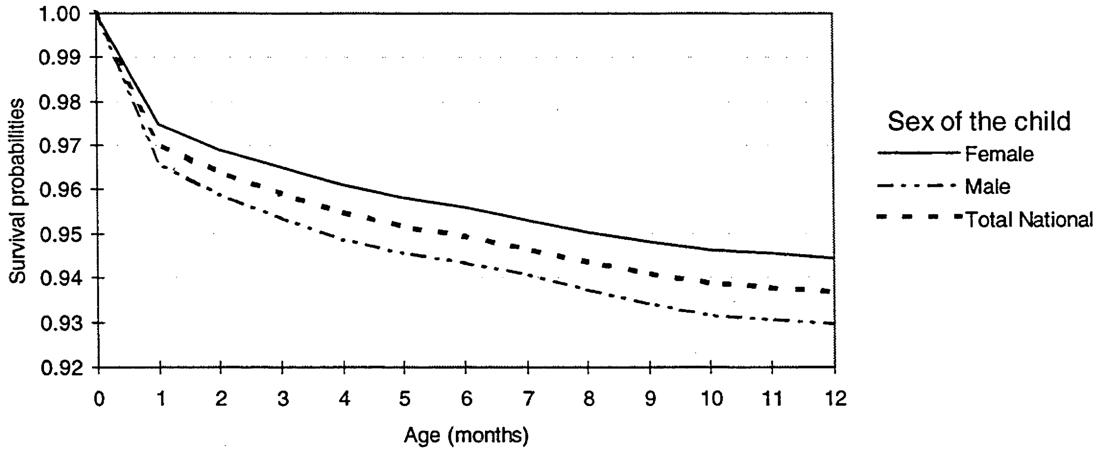
| Variable | Infant mortality ($_0q_1$) per 1,000 | Child mortality ($_4q_1$) per 1,000 |
|---|---|---|
| Sex of the child | | |
| Male | 70 (19927) | 28 (16795) |
| Female | 56 (18701) | 27 (16053) |
| | | |
| Gehan test | 32.90 | 0.63 |
| df | 1 | 1 |
| p | <0.001 | ns |
| | | |
| Birth cohort | | |
| mid 1989-mid 1994 (5years) | 57 (18515) | 26 (14119) |
| mid 1984-mid 1989 (5years) | 69 (20113) | 29 (18729) |
| mid 1979-mid 1984 (5years) | 76 (20500) | 36 (18943) |
| | | |
| Gehan test | 97.81 | 44.79 |
| df | 1 | 1 |
| p | <0.001 | <0.001 |
| | | |
| mid 1984-mid 1994 (10 years) | 63 (38628) | 28 (32848) |
| mid 1979-mid 1989 (10 years) | 72 (40613) | 32 (37672) |
| mid 1979-mid 1994 (15 years) | 68 (59128) | 31 (51791) |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
df is degrees of freedom
p is significant level
ns - Not significant

babies are preferred to females babies (Ruzicka and Chowdury, 1978; Ghubaju, 1984; Majumder, 1989; Chen et al., 1981).

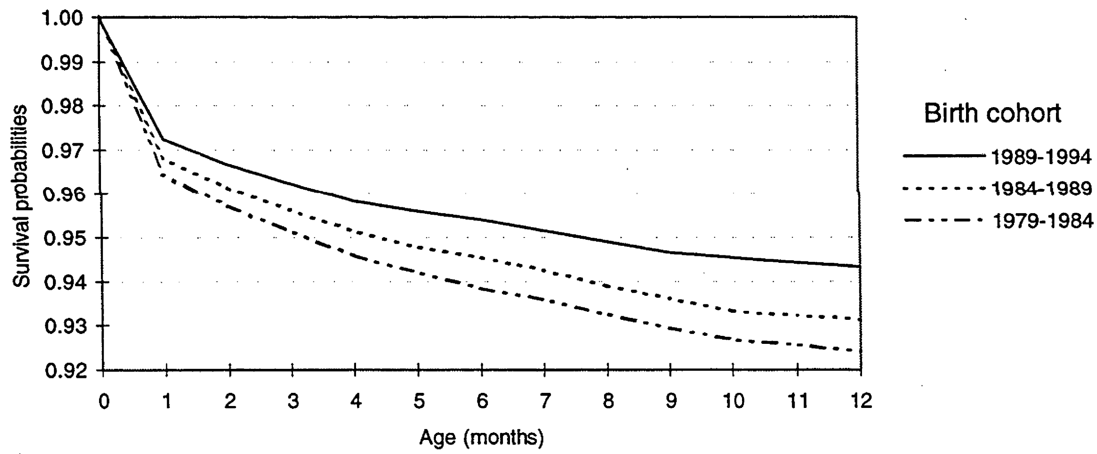
In Indonesia, as would be expected from the general findings of biology, there are higher infant and child mortality rates among males than females. Table 5.1 shows that the difference in infant mortality rates between males and females was very significant at 0.1 per cent, but was not significant for mortality rates of children aged between one and five. The probability of dying before reaching the first birthday for male babies was 25 per cent higher than for female babies. However, for children aged between one and five years, the mortality rates were 28 per 1,000 and 27 per 1,000 for males and females respectively.

Figure 5.1 Survival function of infant according to sex of the child, Indonesia 1984-94, 1994 IDHS




Source: Table A.5.1-5.3

Figure 5.2 Survival function of infant according to birth cohort, Indonesia 1979-94, 1994 IDHS




Source: Table A.5.4-5.6

Figure 5.1 depicts survival functions during the first year of life according to the sex of the child. The survival probability of female babies was consistently higher than males, and the gap of survival was slightly wider when they reached aged one year. Figure 5.2 shows that the probability of infants surviving increased considerably from the 1979-84 cohort to the 1984-89 cohort, and from the 1984-89 cohort to the 1989-94 cohort. The area between 1984-89 and 1989-94 cohorts was almost one and a half times the area between the 1979-84 and 1984-89 cohorts.

The recent birth cohort (mid 1989 - mid 1994) has the lowest mortality rate among all birth cohorts. Mortality decreased 10 per cent from the period 1979-84 to the period 1984-89, and by 21 per cent from the period 1984-89 to the period 1989-94. It has been argued that the recent decline may be because of the improvement in health services and because midwives have been assigned to villages since the beginning of the 1990s in order to improve maternal and child care in rural areas (MOH, 1994a: 77).

## 5.3 Preceding birth interval and survival status of preceding child

With respect to infant and child mortality, there is a correlation between preceding birth interval and the survival status of the preceding child. The death of a child often shortens the next birth interval either because the parent wants to replace the dead child immediately, or the index child's death terminated breastfeeding and the mother subsequently conceived more quickly than she would have if the index child had survived. However, the death of the child also indicates a high-risk family and consequently any subsequent children may be at a higher risk of death. The fact that one sibling has died makes it more likely that other siblings will die as well, as children in the same family presumably are exposed to similar environmental conditions and receive similar care.

Child spacing may affect a child's risk of dying because a longer subsequent birth interval enables a mother to breastfed her child for a longer period of time, uninterrupted by the demand of a subsequent pregnancy. Short birth and pregnancy intervals are reported to be associated with lower birth weight (Da Vanzo et al., 1984: 387; Fortney and Higgins, 1984: 73; Spiers and Wang, 1976: 15). In families with closely spaced births there may be greater competition among children of approximately the same age for scarce family resources. These resources may not only include food, clothing and living space, but also parental time and attention.

Short birth spacing is associated with higher child mortality because infectious diseases may more readily spread among siblings of similar ages who are in close physical proximity most of the time (Thapa and Retherford, 1982: 61). Hobcraft and his colleagues argue that the association between the length of the previous birth interval and child mortality is due almost entirely to maternal depletion, (Hobcraft et al., 1983: 585), that is, deterioration of the mother's physiological condition.

Other factors that may influence the relationship between birth spacing and child mortality are differences in health practices and the use of services, and these may be associated with the social status of a family. Families that are more likely to use health services or to be more aware of health related practices may also be more likely to use contraceptives to space births. Studies of data from the World Fertility Survey were the first to show conclusively that the pace of childbearing is closely linked to the survival chances of children (Rutstein, 1984a). A part of the observed bivariate association appears to be due to household factors, mediated by a desire for a replacement of a deceased child (Hobcraft et al., 1985).

The following analysis focuses on the simple bivariate relationship between interval length and survival status of the preceding child. Table 5.2 shows the infant and child mortality differential according to preceding birth interval and survival status of the preceding child. The results are very highly significant in variables for both infant and child mortality. Coefficients of previous birth intervals are correctly signed, indicating a disadvantage for index children born less than 19 months after the previous birth. Children who had short preceding birth intervals (<19 months), had a 93 per cent higher risk of dying during infancy than those whose with a medium birth interval (19-36 months). In addition, children who had long birth intervals (>36 months), had a 40 per cent lower risk of dying during infancy than those whose with a medium interval. Children born less than 19 months after the birth of the preceding sibling experienced triple the risk of dying than those children born after 37 or more months.

Table 5.2 Infant and child mortality rates according to preceding birth interval and survival status of preceding child, Indonesia 1984-94, 1994 IDHS

| Variable | Infant mortality ($_0q_1$) per 1,000 | Child mortality ($_4q_1$) per 1,000 |
|---|---|---|
| Preceding interval | | |
| First birth | 57 (10037) | 22 (8552) |
| < 19 months | 131 (3900) | 55 (3185) |
| 19-36 months | 68 (12075) | 34 (10406) |
| > 36 months | 41 (12616) | 18 (10735) |
| | | |
| Gehan test | 547.88 | 152.13 |
| df | 3 | 3 |
| p | <0.001 | <0.001 |
| | | |
| Survival of previous child | | |
| First birth/alive | 55 (35367) | 25 (30282) |
| Death | 153 (3261) | 62 (2566) |
| | | |
| Gehan test | 595.20 | 122.87 |
| df | 1 | 1 |
| p | <0.001 | <0.001 |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
df is degrees of freedom
p is significant level

The survival chances are sharply lower for index children from a family whose previous sibling died than for those families whose previous sibling was alive. Babies from families who had experienced a sibling's death had almost three times the risk of dying than those whose previous sibling was alive or when they themselves were first births. Furthermore, the probability of dying during childhood for children whose previous sibling was dead was one and half times greater than those whose previous sibling was alive, or who were first born children.

Table 5.3 shows infant and child mortality rates according to the preceding birth interval and the survival status of the preceding child. The infant and child mortality rate decreases as the preceding interval increases whether the preceding sibling was alive or dead. At all preceding birth intervals, children whose preceding siblings died had a considerably higher mortality rate during both infancy and

Table 5.3 Infant and child mortality rates according to birth interval and survival status of preceding child, Indonesia 1984-94, 1994 IDHS

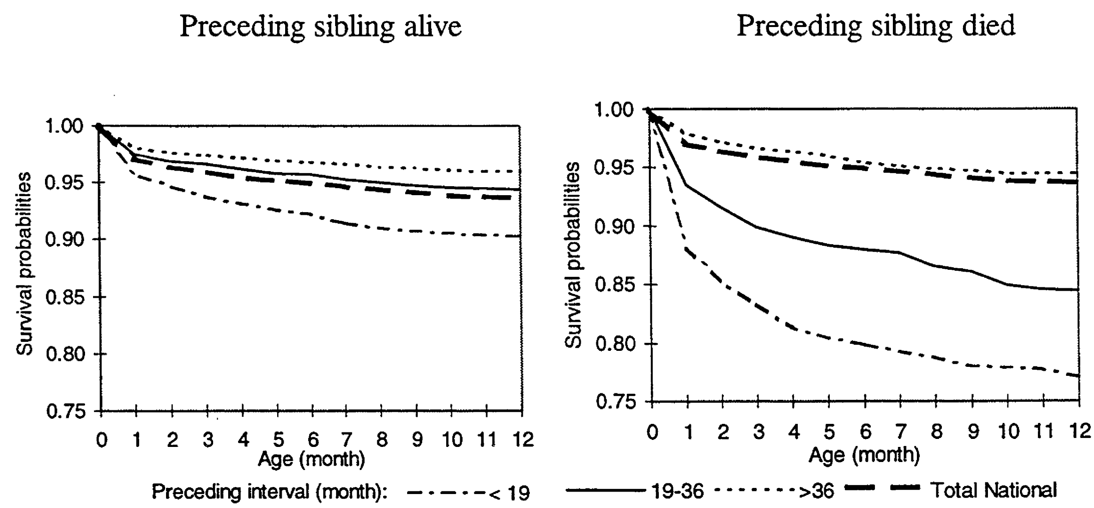
| Variable | Preceding child death | Preceding child alive | Ratio |
|---|---|---|---|
| Infant mortality (1q0) per 1,000 | | | |
| Preceding interval | | | |
| < 19 months | 230 (1007) | 97 (2893) | 2.37 |
| 19-36 months | 156 (1422) | 56 (10653) | 2.78 |
| > 36 months | 55 (832) | 40 (11784) | 1.38 |
| Gehan test | 122.42 | 216.48 | |
| df | 2 | 2 | |
| p | <0.001 | <0.001 | |
| Child mortality (1q0) per 1,000 | | | |
| Preceding interval | | | |
| < 19 months | 81 (727) | 47 (2458) | 1.72 |
| 19-36 months | 66 (1124) | 30 (9282) | 2.20 |
| > 36 months | 32 (715) | 17 (10020) | 1.88 |
| Gehan test | 13.53 | 78.48 | |
| df | 2 | 2 | |
| p | <0.01 | <0.001 | |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
Exclude first births
df is degrees of freedom
p significant level

childhood than those children with a living elder sibling. Children who had multiple risks, short preceding birth intervals, and a prior sibling who had died, experienced the lowest chance of survival during infancy and childhood.

Disregarding whether the previous sibling was alive or dead, Figure 5.3 shows that children who were born after a long interval (>36 months) had the most advantageous chance of surviving in the first year of life. On the other hand, children who were born within a short interval (<19 months), and whose older sibling died, experienced the lowest chance of survival during infancy.

Figure 5.3 Survival functions of infants according to the survival status of preceding child, Indonesia 1984-94, 1994 IDHS




Source: Table A.5.1, 5.7-5.12

## 5.4 Maternal age at first marriage, maternal age at child birth, and birth order of the index child

The empirical relationship between a mother's age and infant mortality follows a U-shape: loss rates are higher for very young and for relatively old mothers. Children born to mothers under age 20 and over age 40 are clearly at a disadvantage. For infant survival the most advantageous maternal age category appears to be between ages 25 and 29. Children who were born to mothers aged less than 20 years old, or more than 40 years old, were 44 per cent more likely to die during infancy than those born to mothers aged 25-29. The differences are highly significant at 0.1 per cent.

A very young or an older maternal age at birth continues to be associated with a heightened risk of childhood mortality beyond infancy. However, the difference of child mortality between very young and very old mothers was significant only at the five per cent level. The data clearly show that the children of older mothers are most at risk.

Table 5.4 Infant and child mortality rates according to maternal age at child birth, maternal age at first married, and birth order, Indonesia 1984-94, 1994 IDHS

| Variable | Infant mortality ($_0q_1$) per 1,000 | Child mortality ($_4q_1$) per 1,000 |
|---|---|---|
| Maternal age at child birth | | |
| < 20 years | 79 (5202) | 30 (4439) |
| 20-24 years | 61 (11615) | 25 (10001) |
| 25-29 years | 55 (10787) | 28 (9236) |
| 30-34 years | 62 (6902) | 26 (5800) |
| 35-39 years | 72 (3250) | 32 (2673) |
| > 39 years | 80 (872) | 42 (699) |
| Gehan test | 51.15 | 12.73 |
| df | 5 | 5 |
| p | <0.001 | <0.05 |
| Maternal age at first marriage | | |
| < 15 years | 89 (5032) | 38 (4265) |
| 15-19 years | 66 (20093) | 29 (17116) |
| 20-24 years | 49 (10778) | 24 (9175) |
| 25-29 years | 48 (2337) | 14 (1967) |
| > 29 years | 71 (388) | 23 (325) |
| Gehan test | 126.37 | 28.74 |
| df | 4 | 4 |
| p | <0.001 | <0.001 |
| Birth Order | | |
| 1st birth | 58 (10037) | 21 (8522) |
| 2nd birth | 55 (8485) | 21 (7265) |
| 3rd birth | 57 (6507) | 25 (5555) |
| 4th birth | 58 (4572) | 35 (3953) |
| 5th birth | 71 (3241) | 34 (2761) |
| 6th birth + | 91 (5786) | 43 (4792) |
| Gehan test | 147.7 | 70.00 |
| df | 5 | 5 |
| p | <0.001 | <0.001 |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk.
df is degrees of freedom.
p is significant level.

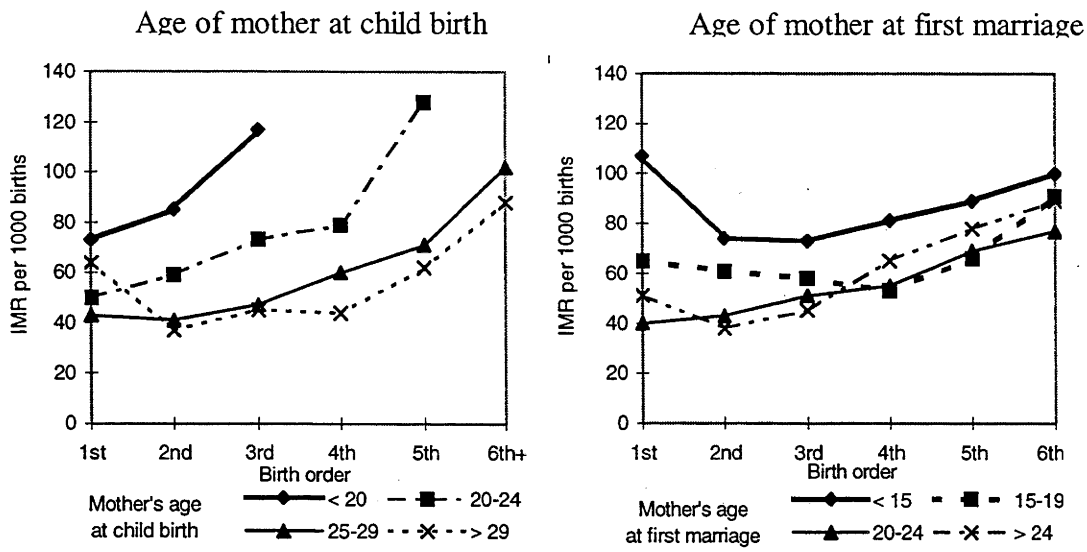
Women who first marry at ages less than 15 years have the highest risk of infant death compared to those who marry over 15 years of age. Women usually give birth soon after they marry, so if they married at ages less than 15 years they are still relatively young when they have the first child. Where age at first marriage is rising, the first birth will often be delayed to a later, generally less risky age. The estimates show that the lowest infant mortality rates are experienced by children born to mothers aged 25 to 29 at first marriage, while the highest was experienced by children who were born to mothers aged less than 15 years at marriage. This may be because a teenage mother is often unprepared biologically, mentally and economically to bear and bring up a child (Hull and Ghubaju, 1986: 115; Martin et al., 1983: 429). However, early marriage is also likely to be associated with low education and low income.

First births occur among young mothers whose children are subject to a higher risk of mortality. On the other hand, they are more likely to be welcomed into the family and as such they are expected to get more attention in terms of food and care. Whereas a first-born child faces less competition for the family's resources, a first delivery may involve more complications. Except for the first birth, the results show that infant mortality rates increase with increasing birth order, but the rise only becomes significant with births of order five and above.

Table 5.5 presents the analysis of infant and child mortality rates according to maternal age at childbirth and maternal age at first marriage, controlling the effect of birth order of the child. The results show that except for first birth order, the risk of infant death declined as mother's age at child birth increased within each birth order category. Figure 5.4 clearly shows that the probability of dying of children under one year increased with birth order, except for those children who were born to women age a 29 years and above for whom the first child was at more risk than the second, third and fourth children.

The risk of dying for the third born infants of teenage mothers (< 20) was very high (117 per thousand live births) compared to the first and second born. This may be

Figure 5.4 Infant mortality rates according to birth order and age of mother at child birth and at first marriage, Indonesia 1984-94, 1994 IDHS




Source: Table 5.5

because of the implied very short interval between siblings, resulting in competition among siblings in child rearing and resources and also the depleted health of teenage mothers.

In all age groups of women, the risk of children dying during the childhood period was higher for those children who had a high birth order. With regards to child mortality, the risk of dying was 25 per 1,000 for the first birth rising to 57 per 1,000 for the third birth.

After controlling the age of mothers at first marriage, infant mortality by birth order of the child has a U shape pattern, except for children born to mothers aged 20 to 24 at first marriage. Their infant mortality rate gradually increased with the increase of birth order (Figure 5.4). Figure 5.4 also clearly shows that children born to women whose age at first marriage was less than 15 years experienced the highest risk for all birth orders.

Table 5.5 shows that the first babies born to women aged less than 15 years at first marriage had a higher risk of dying during infancy than higher birth orders. On the other hand, the first born babies to women aged 20 to 24 years at first marriage had a

Table 5.5 Infant and child mortality rates according to birth order and maternal age, Indonesia 1984-94, 1994 IDHS

| Variable | Birth order | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th | 5th | 6th+ | All |
| Infant mortality ($_1q_0$) per 1,000 | | | | | | | |
| Maternal age at child birth | | | | | | | |
| < 20 years | 73 | 85 | 117 | - | - | - | 79 |
| | (3815) | (1082) | (239) | . | . | . | (5202) |
| 20-24 years | 50 | 59 | 73 | 79 | 128 | - | 61 |
| | (4458) | (3999) | (2057) | (784) | (242) | . | (11615) |
| 25-29 years | 43 | 41 | 47 | 60 | 71 | 102 | 55 |
| | (1429) | (2566) | (2707) | (2004) | (1170) | (911) | (10787) |
| > 29 years | 64 | 37 | 45 | 44 | 62 | 88 | 66 |
| | (335) | (838) | (1504) | (1734) | (1816) | (4797) | (11024) |
| Child mortality ($_4q_0$) per 1,000 | | | | | | | |
| Maternal age at child birth | | | | | | | |
| < 20 years | 25 | 39 | 57 | - | - | - | 30 |
| | (3245) | (938) | (208) | . | . | . | (4439) |
| 20-24 years | 19 | 19 | 29 | 59 | 43 | - | 25 |
| | (3796) | (3475) | (1801) | (690) | (200) | . | (10001) |
| 25-29 years | 19 | 18 | 24 | 33 | 45 | 43 | 28 |
| | (1195) | (2167) | (2341) | (1738) | (1018) | (777) | (9236) |
| > 29 years | 13 | 10 | 14 | 24 | 24 | 42 | 29 |
| | (286) | (705) | (1205) | (1485) | (1537) | (3954) | (9172) |
| Infant mortality (1q0) per 1,000 | | | | | | | |
| Maternal age at first marriage | | | | | | | |
| < 15 years | 107 | 74 | 73 | 81 | 89 | 100 | 89 |
| | (754) | (863) | (809) | (667) | (547) | (1392) | (5632) |
| 15-19 years | 65 | 61 | 58 | 53 | 66 | 91 | 66 |
| | (4792) | (4192) | (3401) | (2541) | (1844) | (3223) | (20093) |
| 20-24 years | 40 | 43 | 51 | 55 | 69 | 77 | 49 |
| | (3466) | (2706) | (1838) | (1126) | (708) | (934) | (10778) |
| > 25 years | 51 | 38 | 45 | 65 | 78 | 89 | 51 |
| | (1025) | (724) | (459) | (238) | (142) | (137) | (2725) |
| Child mortality ($_4q_0$) per 1,000 | | | | | | | |
| Maternal age at first marriage | | | | | | | |
| < 15 years | 32 | 34 | 35 | 53 | 28 | 41 | 38 |
| | (648) | (755) | (703) | (559) | (458) | (1142) | (4265) |
| 15-19 years | 24 | 22 | 25 | 29 | 33 | 45 | 29 |
| | (4033) | (3582) | (2919) | (2231) | (1582) | (2769) | (17116) |
| 20-24 years | 18 | 17 | 24 | 36 | 44 | 42 | 24 |
| | (2998) | (2304) | (1546) | (961) | (602) | (768) | (9175) |
| > 25 years | 11 | 11 | 12 | 39 | 18 | 32 | 15 |
| | (852) | (624) | (387) | (202) | (123) | (113) | (2292) |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
- less than 100 cases

lower risk of dying than those of higher birth orders. This may be because women aged less than 15 years at first marriage usually give birth to the first child soon after they get married. They are still very young, unprepared socially and psychologically. Furthermore, child mortality rates increase with the birth order, after controlling the age of mother at first marriage.

## 5.5 Maternal and paternal education

Education is regarded as an indicator of socio-economic status, linked to the common findings of a negative relationship between education and childhood mortality. Many papers have confirmed the large impact of parental and particularly maternal education on infant and child mortality (Caldwell, 1979).

Caldwell proposed that a general change in education leads to greater Westernisation and modernisation and therefore greater openness to new technology. Maternal education also reduces fatalism, increases awareness of where to seek health services/medical attention, and alters the intra household power relationship in a way more directly beneficial to children (Caldwell, 1979, 1986; CBS, 1994a). Ware (1984) also reviewed the mechanisms of women's role which can affect a child's survival. Educated women are better nourished and tend to have a lesser likelihood of low birth weight babies. The education of the mother reduces mortality because more educated mothers are able to make better use of existing health services both for preventive and curative purposes than less educated mothers. Mothers who were educated are more likely to be responsive to ideas and services, and have more social confidence to travel outside the home community to seek services (Ware, 1984). Furthermore, research in 1993, which investigated the association of maternal education with awareness and knowledge and beliefs related to major childhood disease, controlling for health intervention programs, confirmed a positive effect of maternal education on these variables (Bhuiya et. al., 1993).

The WFS was the first multi national fertility survey that established a strong negative association between maternal education and fertility in most developing countries. Findings on the effects of female education and child mortality were an important by-product of fertility surveys. It was discovered that there was an equally robust and strong association between infant and child mortality and female education across 41 countries. However, the relationship was stronger during childhood than in infancy (Rutstein, 1984b). Gursoy-Tezcan (1992) found that in Istanbul the most significant variables associated with child mortality were not attributes of the mother, but attributes of the father and the characteristics of the household (Gursoy–Tezcan, 1992). Furthermore, a set of case studies on child mortality found that only in Senegal parents' education was not significant as an explanatory variable (UN, 1986).

Table 5.6 shows infant and child mortality rates decreasing with an increase in paternal education. The results show that children born to mothers with a complete secondary education experienced a lower infant mortality rate than those born to less educated women. Children who were born to women with no education or some education had a 50 per cent higher risk of dying during infancy than those whose mothers completed primary school, and two and a half times the risk of children of mothers with secondary school and higher education. However, the child mortality rate for children who were born to mothers who had no education or some education was almost five times higher than that for those who had completed secondary school or above.

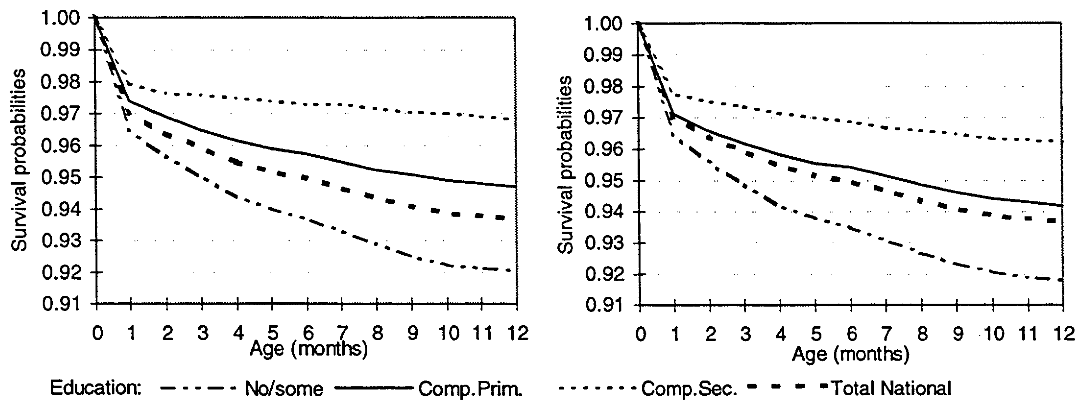
After combining parental educations, both the education of the mother and the father were very important in reducing infant and child mortality. The universal tendency is for better-educated women to marry similarly educated men and to enjoy a relatively high standard of living. The results show that if one of the parents was uneducated, the rates of infant and child mortality remain high. The father's education was slightly more important in reducing infant mortality, while the mother's education was more important in reducing child mortality.

Table 5.6 Infant and child mortality rates according to maternal and paternal education, Indonesia 1984-94, 1994 IDHS

| Variable | Infant mortality ($_0q_1$) per 1,000 | Child mortality ($_4q_1$) per 1,000 |
|---|---|---|
| Maternal education | | |
| No education / some education | 80 (18841) | 38 (16096) |
| Complete primary | 53 (14406) | 20 (12234) |
| Complete secondary + | 32 (5381) | 8 (4518) |
| Gehan test | 293.32 | 120.35 |
| df | 2 | 2 |
| p | <0.001 | <0.001 |
| Paternal education | | |
| No education / some education | 82 (15111) | 39 (12866) |
| Complete primary | 58 (15359) | 24 (13069) |
| Complete secondary | 38 (8093) | 13 (6862) |
| Gehan test | 264.99 | 104.75 |
| df | 2 | 2 |
| p | <0.001 | <0.001 |
| Maternal and paternal education | | |
| Both not educated / some education | 83 (12548) | 41 (10724) |
| Mother not educated, father educated | 75 (6268) | 32 (5352) |
| Mother educated, father not educated | 79 (2563) | 30 (2142) |
| Both educated | 42 (17184) | 15 (14579) |
| Gehan test | 325.13 | 126.45 |
| df | 3 | 3 |
| p | <0.001 | <0.001 |
| Maternal and paternal education | | |
| Both no education | 83 (12548) | 41 (10724) |
| Mother no education, father primary | 74 (5543) | 33 (4746) |
| Mother no education, father secondary+ | 78 (725) | 24 (606) |
| Mother primary father no education | 79 (2438) | 31 (2038) |
| Both primary | 50 (8835) | 18 (7507) |
| Mother primary, father secondary + | 42 (3101) | 19 (2665) |
| Mother secondary+, father no education | 75 (125) | 23 (104) |
| Mother secondary+, father primary | 43 (981) | 15 (816) |
| Both secondary + | 28 (4267) | 7 (3591) |
| Gehan test | 355.70 | 139.61 |
| df | 8 | 8 |
| p | <0.001 | <0.001 |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
df is degrees of freedom
p is significant level

Figure 5.5 Survival function of infants according to parental education, Indonesia 1984-94, 1994 IDHS




Source: Table A.5.1, 5.13 - 5.18

Figure 5.5 shows that the survival chance of children during infancy of educated mothers is higher than those of educated fathers. The slope of the survival curve for mothers who completed secondary school is more level than that of fathers who completed secondary education. Further, the gap between the survival curve for mothers who completed primary and all mothers is wider than for fathers.

## 5.6 Place of residence and socio-economic factors

Factors affecting infant and child mortality are well documented in the analysis of the difference between urban and rural communities. These differentials are related to socio-economic conditions and circumstances in which the members of the two communities live. There is no doubt that modern medical facilities and health services, availability of safe drinking water, and sewage disposal are all more likely to be found in urban areas than in rural areas. However, urban facilities are not uniformly distributed among the members of a particular community. Some urban residents may have lower incomes, be less educated, may live in over-crowded unsanitary dwellings in slum areas, and may live in worse conditions than those who live in rural areas.

Previous studies conducted in Indonesia all indicate that children who live in urban areas have a better chance of life than those who live in rural areas (Cho et al., 1976; McNicoll and Mamas, 1973). The place of residence of the respondents is defined at the time of interview, according to the location of the interview (de facto place). Consequently, for migrants, some births and deaths may have occurred in a previous place of residence. The 1994 IDHS surveys did not include a migration history and thus some deaths may have occurred at another place and are not correctly allocated.

The ability to read a letter or newspaper, and the habitual reading of a newspaper at least once a week, highly correlates with the educational attainment of respondents. Studies from many different developing countries have shown that a mother's literacy and schooling are closely related to child survival. The ability to send one's children to school, in most less developed countries, depends upon the family having a certain level of income, and as general rule, the wealthier the family the longer the children remain at school. But these higher levels of income and wealth also enable the children to enjoy better nutrition and better access to health services (Cleland and van Ginneken, 1988: 1357-1368).

Sandiford and his colleague's studies in Masaya province, Nicaragua, found that literate women are significantly better-off than those who are illiterate. The proportion of children who had died was consistently lower for women in the adult education and formal schooling group than in the illiterate group (Sandiford et al., 1995: 10).

Tables 5.7 and 5.8 present the analysis of infant and child mortality rates according to socio-economic indicators and place of residence. The mother's ability to read a letter/newspaper is significant with respect to infant and child mortality rates in both urban and rural areas, and in Indonesia as a whole. Table 5.7 shows that children who were born to mothers who were unable or had difficulty reading letters or newspapers were more likely to die during infancy than those born to mothers who could easily read a letter or newspaper (by at least 42 per cent in rural areas and 112 per cent in urban areas).

Table 5.7 Infant mortality rates according to socio-economic factors and place of residence, Indonesia 1984-94, 1994 IDHS

| Variable | Urban | Rural | Total |
|---|---|---|---|
| Ability to read letter/newspaper | | | |
| Easily | 34 (7956) | 60 (16400) | 51 (24356) |
| Not at all / with difficulty | 72 (1774) | 85 (12498) | 83 (14272) |
| Gehan test | 66.26 *** | 109.37 *** | 235.17 *** |
| Read newspaper once a week | | | |
| Yes | 32 (4407) | 55 (4491) | 43 (8898) |
| No | 48 (5323) | 74 (24357) | 69 (29680) |
| Gehan test | 14.45 *** | 20.36 *** | 70.61 *** |
| Watching TV once a week | | | |
| Yes | 40 (8712) | 70 (14913) | 59 (23625) |
| No | 54 (1005) | 72 (13933) | 71 (14938) |
| Gehan test | 15.66 *** | 7.52 ** | 62.43 *** |
| Ability to speak Indonesian language | | | |
| Yes | 39 (9333) | 69 (23710) | 60 (33043) |
| No | 92 (397) | 79 (5188) | 80 (5585) |
| Gehan test | 37.74 *** | 20.36 *** | 65.90 *** |
| Husband occupation | | | |
| Professional, manager | 25 (1367) | 45 (1751) | 37 (3118) |
| Clerk | 34 (1310) | 51 (1149) | 42 (2459) |
| Sales/service | 39 (2687) | 66 (2959) | 53 (5646) |
| Industrial worker | 45 (3334) | 67 (4642) | 58 (7976) |
| Agricultural worker | 64 (801) | 76 (17912) | 75 (18713) |
| Gehan test | 34.51 *** | 51.29 *** | 182.01 *** |

Source: Primary analysis of the 1994 IDHS, using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

Children in urban areas, who were born to mothers who read newspapers once a week, had a 50 per cent greater chance of survival during infancy than those of mothers who never read letters/newspapers. Children in rural areas had a 35 per cent increased risk of dying during infancy. Those children who were born to mothers who watched TV at least once a week also experienced a higher chance of survival during infancy.

Furthermore, Table 5.8 shows that children in urban areas, who were born to mothers that never read newspapers were three times more likely to die during

Table 5.8 Child mortality rates according to social factors and place of residence, Indonesia 1984-94, 1994 IDHS

| Variable | Urban | Rural | Total |
|---|---|---|---|
| Ability to read letter/newspaper | | | |
| Easily | 11 (6889) | 25 (13779) | 20 (20668) |
| Not at all / with difficulty | 25 (1538) | 42 (10642) | 40 (12180) |
| Gehan test | 20.58 *** | 52.60 *** | 104.94 *** |
| Read newspaper once a week | | | |
| Yes | 6 (3838) | 20 (3782) | 13 (7620) |
| No | 19 (4589) | 35 (20596) | 32 (25185) |
| Gehan test | 16.72 *** | 10.50 ** | 42.46 *** |
| Watching TV once a week | | | |
| Yes | 11 (7554) | 26 (12646) | 21 (20200) |
| No | 36 (861) | 39 (11725) | 39 (12586) |
| Gehan test | 30.77 *** | 29.24 *** | 87.07 *** |
| Ability to speak Indonesian language | | | |
| Yes | 12 (8092) | 29 (19994) | 24 (28086) |
| No | 37 (335) | 47 (4427) | 46 (4762) |
| Gehan test | 15.10 *** | 34.24 *** | 68.68 *** |
| Husband occupation | | | |
| Professional, manager | 6 (1194) | 21 (1517) | 14 (2711) |
| Clerk | 8 (1132) | 20 (980) | 13 (2112) |
| Sales/service | 13 (2349) | 24 (2501) | 19 (4850) |
| Industrial worker | 15 (2896) | 29 (3915) | 23 (6781) |
| Agricultural worker | 31 (691) | 37 (15097) | 37 (15788) |
| Gehan test | 22.05 *** | 27.26 *** | 91.76 *** |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

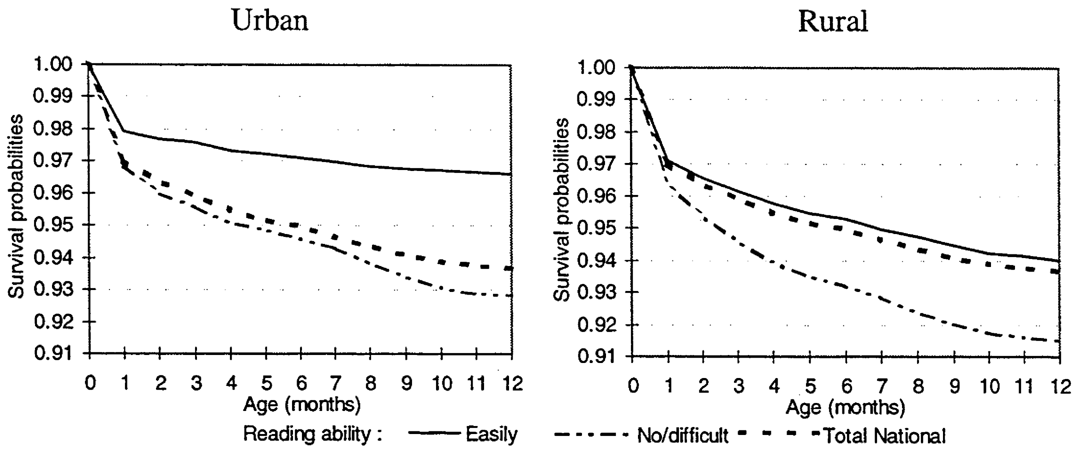
childhood than those children whose mothers read newspapers at least once a week. The effect of media on mortality was more pronounced in child mortality than infant mortality. This may be because women who read newspapers and watch television can easily obtain knowledge and awareness of health care services or it may simply reflect the relatively greater impact of socio-economic status upon child mortality, with newspapers reading being an indicator of socio-economic status.

Table 5.7 shows the difference in infant mortality rates with respect to mothers speaking the Indonesian language according to the place of residence. In urban areas children who were born to mothers who were unable to speak the Indonesian language had a higher risk of dying during infancy than those children who live in rural areas. Urban mothers who were unable to speak the Indonesian language usually had a low educational level, a low socio-economic condition, and might live in overcrowded and unsanitary dwellings in slum areas. These slum areas are unable to afford urban facilities such as health services, medicine and clean water.

The father's occupation is usually used as a proxy variable for the income and social status of the family. The occupation of the father collected in this data set is the current occupation, not the occupation at the time of a child's death. The interpretation of this variable should be treated cautiously because the occupational status of the father is subject to change throughout life. Table 5.7 shows that almost half of the children were born to fathers that were employed in the agricultural sector. Children who were born to fathers employed in professional or managerial jobs constituted 8.2 per cent, while those who were born to fathers who were clerks, sales/service workers, and industrial workers were 6.5, 14.9 and 21.0 per cent respectively. The results in Table 5.7 depict that the infant mortality rates were significantly related to the father's occupation in both urban and rural areas and in Indonesia as a whole. Infant mortality was lowest among children of fathers who worked as professionals or managers, and highest among children whose fathers worked as an agricultural worker. However, it was found in urban areas that the estimation of child mortality rates for fathers who worked as professionals or managers were one fifth of those for fathers employed as agricultural workers (Table 5.8). The results confirmed that the affect of the father's occupation was more significant with respect to child mortality than infant mortality, especially in urban areas.

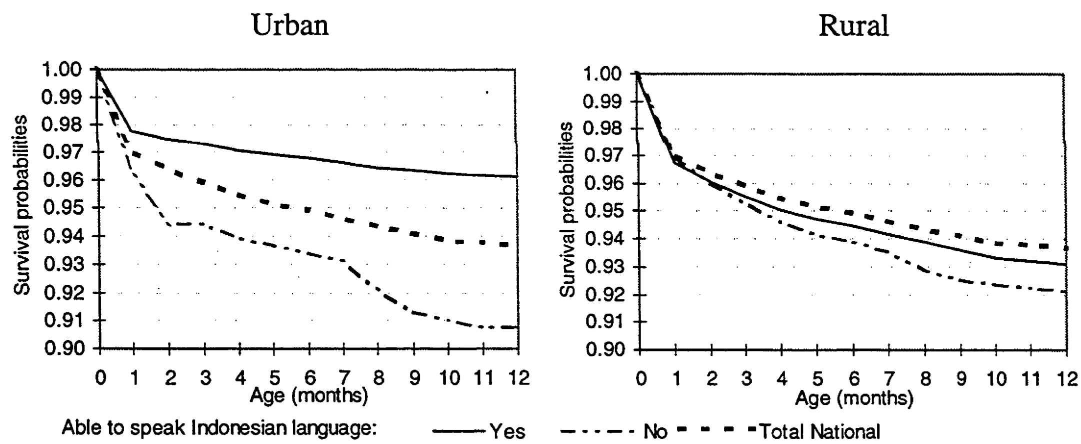
Figure 5.7 shows that the impact of the mother's ability to read letters or newspapers on the survival chance of the child during infancy was significant compared to the national level. Urban children who were born to mothers who were able to read letters or newspapers had the most advantageous survival chance compared to other children; the survivals slope was far above the national level. In addition, the survivals

Figure 5.6 Survival function of infants according to the ability of the mother to read letters/newspapers, and place of residence, Indonesia 1984-94, 1994 IDHS




Source: Table A.5.1, 5.19 - 5.22

Figure 5.7 Survival function of infants according to the ability of the mother to speak the Indonesian language, and place of residence, Indonesia 1984-94, 1994 IDHS




Source: Table A.5.1, 5.23 - 5.26

of urban children who were born to mothers who were unable to read letters or newspapers and those rural children who were born to mothers who were able to read letters or newspapers were not significantly different. The children born to mothers who were unable to read letters or newspapers in urban areas had slightly below the national level of survival, while children born to mothers who were able to read letters or newspapers had slightly above the national level. However, the chance of survival for children of mothers who were unable to read letters or newspapers in rural areas was very low compared to other children.

The gap in the survival functions of infants during the first year of life according to the ability of mothers to speak the Indonesian language in urban areas was very wide. The survival chance of children, who were born to mothers who are not able to speak the Indonesian language, dropped considerably in the first month of life, and continued to fall for six months although at a reduced rate. It then dropped again sharply from six months up to eight months of life. This may be due to the small sample. Non-Indonesian speakers in urban areas mainly come from the outer islands of Java-Bali. In rural areas, the ability of the mother to speak the Indonesian language was insufficient to raise the survival function above the national level, but the ability to speak the Indonesian language has a significant impact on increasing the survival probability during infancy.

## 5.7 Housing indicators

Tables 5.9 and 5.10 show that the pattern of infant and child mortality rates were not uniform with respect to ownership of the house and place of residence. The tables show that ownership of the house could not be used as a good measure of the socio-economic status of the family or individual. Table 5.9 shows that at the national level and in urban areas the most advantageous infants were those who lived in 'mortgage' or 'contract' houses, while in rural areas the most advantageous were infants who lived in 'official' houses. Householders who live in 'mortgage' or 'contract' houses in urban areas were usually young middle class educated families who could afford such housing. These families tend to have low infant mortality. Those families who own their house are mostly families who have already been married for a long time or a young family that has inherited the house from their parents. Furthermore, Table 5.10 shows that children who lived in official houses had the lowest risk of dying during childhood compared to those whose lived in other types of houses. The head of the household that received their house from their office or

Table 5.9 Infant mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS

| Variable | Urban | Rural | Total |
|---|---|---|---|
| Ownership of the house | | | |
| Own | 44 (5985) | 72 (25861) | 67 (31846) |
| Mortgage, contract | 26 (1511) | 40 (280) | 28 (1791) |
| Rent | 53 (840) | 72 (311) | 58 (1151) |
| Official | 33 (614) | 38 (1015) | 36 (1629) |
| Other | 38 (777) | 84 (1418) | 68 (2195) |
| Gehan test | 16.18 ** | 36.33 *** | 89.54 *** |
| Main material of the roof | | | |
| Concrete,tile,asbestos,zinc | 40 (8820) | 66 (18254) | 57 (27074) |
| Wood | 44 (393) | 76 (1896) | 70 (2289) |
| Leaves, other | 63 (517) | 80 (8741) | 79 (9265) |
| Gehan test | 6.71 * | 36.53 *** | 97.42 *** |
| Main material of the wall | | | |
| Brick | 35 (6055) | 61 (8052) | 50 (14107) |
| Wood | 46 (2829) | 71 (13253) | 67 (16165) |
| Bamboo, other | 68 (754) | 81 (7565) | 79 (8319) |
| Gehan test | 28.12 *** | 41.30 *** | 132.90 *** |
| Main material of the floor | | | |
| Ceramic, marble | 20 (407) | 66 (110) | 30 (517) |
| Tile | 28 (2222) | 60 (1077) | 39 (3299) |
| Concrete, brick | 44 (4956) | 63 (8776) | 56 (13732) |
| Bamboo/wood | 53 (1506) | 80 (10789) | 76 (12295) |
| Dirt, earth, other | 47 (612) | 69 (8110) | 67 (8722) |
| Gehan test | 22.95 *** | 46.37 *** | 155.30 *** |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

company usually had a higher position in the company and was better educated. These families usually received better privileges from their office or company (such as health insurance) and were better off than other families in the same company.

As an indicator of the socio-economic condition of the household, the main material of the house could be used as a proxy for environmental sanitation of the house, which is related to the risk of childhood death. The differences in child mortalityaccording to the main material of the roof, wall and the floor had a uniform pattern. The results show that the better the material of the roof, wall and floor, the

Table 5.10 Child mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS

| Variable | Urban | Rural | Total |
|---|---|---|---|
| Ownership of the house | | | |
| Own | 13 (5209) | 33 (21903) | 29 (27112) |
| Mortgage, contract | 11 (1313) | 26 (239) | 14 (1552) |
| Rent | 20 (706) | 52 (250) | 28 (956) |
| Official | 4 (540) | 9 (877) | 7 (1417) |
| Other | 25 (656) | 37 (1140) | 33 (1796) |
| Gehan test | 11.20 * | 16.60 ** | 32.63 *** |
| Main material of the roof | | | |
| Concrete,tile,asbestos,zinc | 13 (7652) | 28 (15484) | 23 (23136) |
| Wood | 13 (331) | 33 (1638) | 29 (1696) |
| Leaves, other | 16 (444) | 42 (7299) | 40 (7743) |
| Gehan test | 0.46 | 28.76 *** | 59.77 *** |
| Main material of the wall | | | |
| Brick | 9 (5282) | 24 (6821) | 18 (12103) |
| Wood | 19 (2504) | 32 (11285) | 29 (13789) |
| Bamboo, other | 25 (634) | 43 (6293) | 42 (6927) |
| Gehan test | 12.34 ** | 30.82 *** | 75.83 *** |
| Main material of the floor | | | |
| Ceramic, marble | 7 (374) | - (-) | 6 (462) |
| Tile | 12 (1952) | 14 (935) | 13 (2887) |
| Concrete, brick | 11 (4272) | 23 (7451) | 19 (11723) |
| Bamboo/wood | 16 (1278) | 39 (9074) | 36 (10352) |
| Dirt, earth, other | 34 (528) | 37 (6846) | 36 (7374) |
| Gehan test | 16.68 ** | 42.21 *** | 97.71 *** |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

lower the infant and child mortality rate. The result is mostly significant, at least five per cent, except for the variable of the material of the roof.

Table 5.9 shows that children born in the house with bamboo/wood as the material of the floor had more risk of dying during infancy than those who were born in houses with dirt/earth floor. This may be because houses with wood or bamboo floors in some provinces of Indonesia is a two-level house where the room under the house is used to as a stable for their poultry or cattle. The animal feces are a source of disease easily transmitted to the infants. However, Table 5.10 shows that children who live in a house with dirt floors in urban areas had the highest risk of dying during

Table 5.11 Infant mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS

| Variable | Urban | Rural | Total |
|---|---|---|---|
| Source of drinking water | | | |
| Pipe | 35 (3086) | 36 (1403) | 35 (4489) |
| Public tap/pump/prot.well | 40 (5476) | 67 (12022) | 58 (17498) |
| Other | 64 (1168) | 77 (15473) | 76 (16641) |
| Gehan test | 26.71 *** | 59.15 *** | 177.43 *** |
| Type of toilet facility | | | |
| Private with septic tank | 28 (4031) | 39 (2661) | 33 (6692) |
| Private no septic tank | 41 (2463) | 60 (6877) | 55 (9340) |
| Shared/Public | 53 (1523) | 67 (1836) | 60 (3359) |
| River, stream, pit, bush | 61 (1713) | 80 (17524) | 79 (19237) |
| Gehan test | 54.31 *** | 102.91 *** | 267.47 *** |
| Availability of electricity | | | |
| Yes | 39 (8979) | 64 (10914) | 53 (19893) |
| No | 64 (750) | 75 (17966) | 74 (18716) |
| Gehan test | 21.54 *** | 32.51 *** | 147.17 *** |
| Ownership of radio or TV | | | |
| Yes | 38 (8311) | 67 (15579) | 57 (23890) |
| No | 61 (1419) | 75 (13319) | 74 (14738) |
| Gehan test | 26.48 *** | 16.43 *** | 79.70 *** |
| Ownership of stove | | | |
| Yes | 37 (8209) | 63 (6258) | 4872 (14467) |
| No | 61 (1521) | 73 (22640) | 149.93 (24161) |
| Gehan test | 26.43 *** | 20.04 *** | *** |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

childhood compared to those who lived in houses with a better material on the floor. At the national level, the risk of dying during childhood of those who live in a dirt floor house are the same as those who live in a house with a wood or bamboo floor.

Tables 5.11 and 5.12 present infant and child mortality rates according to household indicators and place of residence. Household indicators such as source of drinking water, type of toilet facility, availability of electricity, ownership of radio or television, and ownership of a stove were all associated with infant mortality. Mortality differentials according to household indicators were greater for children than for infants.

Table 5.12 Child mortality rates according to household factors and place of residence, Indonesia 1984-94, 1994 IDHS

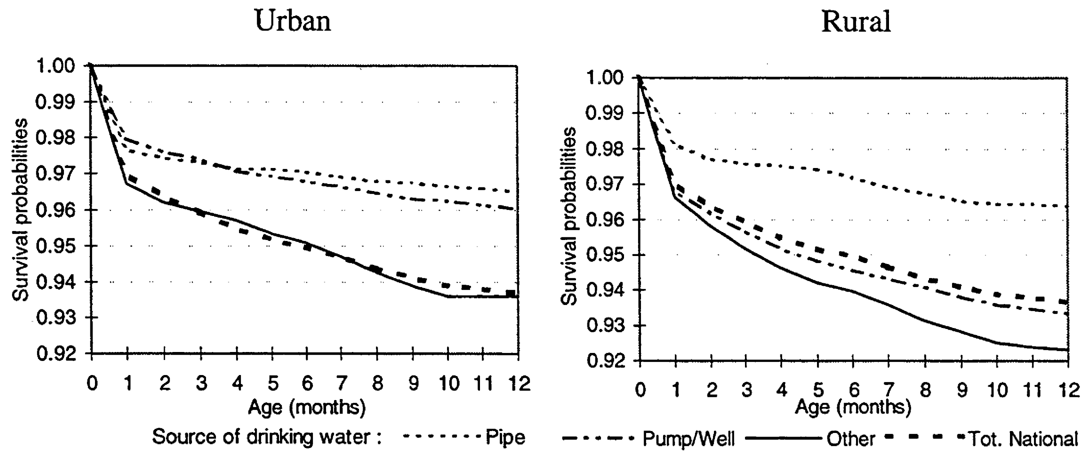
| Variable | Urban | Rural | Total |
|---|---|---|---|
| Source of drinking water | | | |
| Pipe | 7 (2683) | 11 (1230) | 9 (3913) |
| Public tap/pump/prot.well | 14 (4754) | 28 (10129) | 24 (14883) |
| Other | 24 (990) | 38 (13062) | 37 (14052) |
| Gehan test | 14.94 *** | 29.49 *** | 90.49 *** |
| Type of toilet facility | | | |
| Private with septic tank | 8 (3541) | 20 (2328) | 13 (5869) |
| Private no septic tank | 8 (2112) | 25 (5896) | 20 (8008) |
| Shared/Public | 23 (1293) | 25 (1554) | 24 (2847) |
| River, stream, pit, bush | 25 (1481) | 39 (14643) | 37 (16124) |
| Gehan test | 28.23 *** | 35.26 *** | 99.45 *** |
| Availability of electricity | | | |
| Yes | 12 (7796) | 22 (9277) | 18 (17073) |
| No | 34 (631) | 39 (15127) | 39 (15758) |
| Gehan test | 18.44 *** | 43.11 *** | 117.81 *** |
| Ownership of radio or TV | | | |
| Yes | 11 (7244) | 28 (13223) | 22 (20467) |
| No | 27 (1183) | 38 (11198) | 37 (12381) |
| Gehan test | 19.02 *** | 20.06 *** | 62.10 *** |
| Ownership of stove | | | |
| Yes | 12 (7124) | 20 (5295) | 15 (12419) |
| No | 23 (1303) | 36 (19126) | 35 (20429) |
| Gehan test | 11.79 *** | 27.18 *** | 98.33 *** |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.
Notes : Figure in brackets represent the number of cases at risk
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

Piped water is assumed to be the best quality water compared to other sources of water. Table 5.11 shows that children born in households with piped water as their source of drinking water had half the risk of dying during infancy than those children born in households with 'other' (pit, river, or streams) as their source of drinking water. Furthermore, the risk of dying during childhood of children using piped water was one third that of children with 'other' as the source of drinking water (Table 5.12)

The possession of a toilet facility is also significant in reducing infant and child mortality in urban and rural areas. Children in households using a private toilet with a septic tank had a lower risk of dying than children in households using other toilets.

Figure 5.8 Survival function of infants according to the source of drinking water and place of residence, Indonesia 1984-94, 1994 IDHS

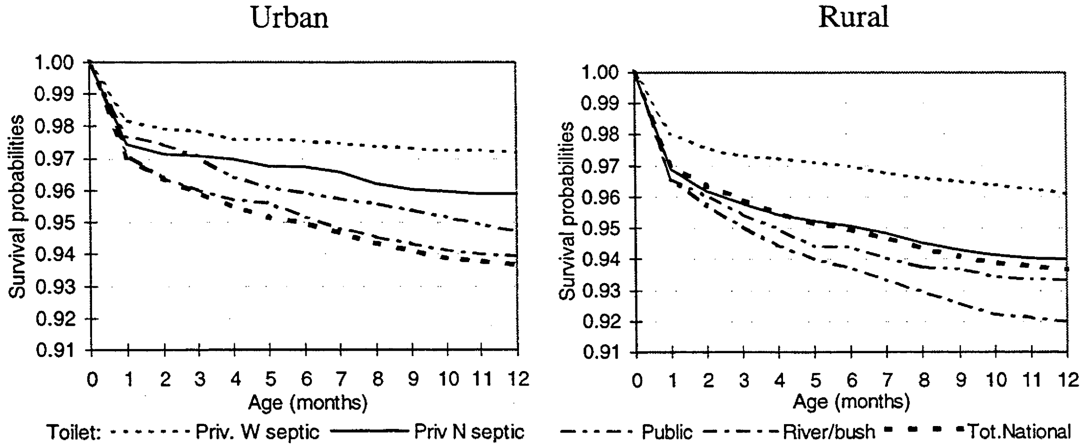



Source: Table A. 5.1, 5.27-5.32

Figure 5.8 shows the survival function of children under one year according to household indicators. Children born in households with piped water had a significantly greater chance of life during infancy than those born in households without piped water, especially in rural areas. However, in urban areas, there was no great difference in the survival functions of households with piped water and households with pumps and wells.

Figure 5.9 shows the survival function differences of children during infancy with respect to the availability of a household toilet facility. The results were consistent with expectations, as households that had no toilet facility were associated with higher infant mortality than those that had toilet facilities both in urban and rural areas. The highest survival chance during infancy was for children who were born in households using a private toilet with a septic tank for disposal. The next higher chance of survival during the first year of life was for children who were born in the household with a private toilet without a septic tank. The next was for those using a public toilet. The most at risk of dying were those who were born in a household which used the river/bush as their toilet.

Figure 5.9 Survival functions of infants according to toilet facilities and place of residence, Indonesia 1984-94, 1994 IDHS




Source: Table A. 5.1, 5.33-5.40

## 5.8 Health care factors

Many infants die from preventable or curable conditions because they and their mothers get little or no medical care before, during, or after birth. By monitoring the condition of the mother and the developing fetus, trained observers can identify high-risk pregnancies and recommend appropriate intervention when necessary. Neonatal tetanus, which is a major killer of infants in some parts of the world is commonly the result of unclean hands or instruments used during childbirth. In some rural areas of Indonesia, it is common practice to cut the newborn's umbilical cord with a bamboo knife, and to 'treat' the naval with ashes or mud. Teaching birth attendants the basic principles of hygiene is an inexpensive way to reduce infant mortality where there are few nurses or doctors.

Table 5.13 shows the difference in infant mortality rates with respect to health care factors according to the place of residence. Children born to mothers who went to a doctor during pregnancy had the lowest infant mortality rate than those who visited a nurse/midwife or a traditional birth attendant (TBA). In urban areas, children who were born to mothers who visited TBA were four times more likely to die during infancy than those who visited a doctor: in rural, areas the figure was only two times.

Table 5.13 Infant mortality rates according to health care factors and place of residence, Indonesia 1989-94, 1994 IDHS

| Variable | Urban | | Rural | | Total | |
|---|---|---|---|---|---|---|
| Prenatal care | | | | | | |
| Doctor | 18 | (1219) | 40 | (938) | 28 | (2157) |
| Nurse/midwife | 34 | (3472) | 54 | (9269) | 48 | (12741) |
| Traditional birth attendant | 73 | (237) | 83 | (3533) | 82 | (3770) |
| Gehan test | 24.53 *** | | 63.99 *** | | 131.03 *** | |
| Timing of 1st prenatal check | | | | | | |
| 0-3 months | 27 | (3527) | 46 | (6330) | 39 | (9857) |
| 4-9 months | 39 | (1214) | 64 | (4663) | 59 | (5877) |
| Never[a)] | 82 | (187) | 87 | (2747) | 87 | (2934) |
| Gehan test | 23.29 *** | | 75.56 *** | | 141.37 *** | |
| Prenatal visits | | | | | | |
| 1-5 times | 52 | (1270) | 60 | (6608) | 59 | (7878) |
| 6-10 times | 23 | (2186) | 46 | (3612) | 38 | (5798) |
| > 10 times | 20 | (1254) | 30 | (717) | 23 | (1971) |
| Never[a)] | 75 | (218) | 87 | (2803) | 86 | (3021) |
| Gehan test | 43.34 *** | | 88.18 *** | | 183.11 *** | |
| Tetanus injection during pregnancy | | | | | | |
| Yes | 27 | (3790) | 48 | (8096) | 41 | (11886) |
| No | 50 | (1138) | 78 | (9644) | 73 | (6782) |
| Gehan test | 13.05 *** | | 73.32 *** | | 115.23 *** | |
| Place of delivery | | | | | | |
| Paramedic place | 26 | (2658) | 45 | (1308) | 33 | (3575) |
| Home | 37 | (2267) | 62 | (12422) | 57 | (15080) |
| Gehan test | 5.47 * | | 6.9 ** | | 42.28 *** | |
| Assistance at delivery | | | | | | |
| Professional paramedic | 26 | (3797) | 45 | (3562) | 35 | (7359) |
| Traditional Birth attendance | 54 | (1131) | 66 | (10178) | 64 | (11309) |
| Gehan test | 23.68 *** | | 28.82 *** | | 97.26 *** | |
| Born | | | | | | |
| On time/mature | 28 | (9744) | 56 | (13459) | 48 | (18203) |
| Prematurely | 44 | (181) | 294 | (266) | 233 | (447) |
| Gehan test | 78.07 *** | | 264.34 *** | | 300.30 *** | |
| Size of the baby | | | | | | |
| Large | 28 | (1721) | 48 | (4250) | 43 | (5971) |
| Average | 28 | (2587) | 56 | (7571) | 49 | (10158) |
| Small | 62 | (588) | 102 | (1863) | 93 | (2451) |
| Gehan test | 19.44 *** | | 77.14 *** | | 99.92 *** | |

Source: Primary analysis of the 1994 IDHS using life table survival analysis.

Notes : Figure in brackets represent the number of cases at risk

* Significant at the five per cent level.

** Significant at the one per cent level.

*** Significant at the 0.1 per cent level.

[a)] Include the answer of 'don't know', therefore, the frequencies of 'Never' in the 1st prenatal check and in the prenatal visit are different.

Children of mothers who never had a prenatal check of their pregnancy had the lowest survival chance of life during infancy. The survival chance rises with the increase in the number of prenatal visits. A tetanus injection during pregnancy also contributed to increasing the survival chance of children during infancy. Furthermore, the place of delivery had a significant effect on infant mortality. Place of delivery is associated with the assistance at delivery. TBA are more likely to assist mothers who delivered at home than professional paramedics, and the vice versa.

Premature births in rural areas had the most disadvantageous effect in terms of survival chance during infancy. This high infant mortality can be reduced if equipment such as 'incubators' were available in rural areas.

The effect of health care differentials on infant mortality was more pronounced in urban areas. This effect was not only due to the differential in the utilisation of health care services *per se*, but also because of high disparities in socio-economic status especially income of the households in urban areas. Many people in rural areas lack health care because there are no facilities or trained people within reach. But for many others, both rural and urban, the lack of access is a function of low income (Newland, 1981).

## 5.9 Summary

Infant mortality and child mortality rates decreased considerably from the period 1979-84 to the period 1989-94. The infant mortality rate decreased 2.2 per cent while child mortality decreased 2.6 per cent annually. These reductions were related to health services development in that period of time as discussed in Chapter Three.

In Indonesia, lower infant mortality rates can be attributed in part to a reduction in the number of high-risk births involving pregnancies which are too close together, which are to women who have already had four or more pregnancies, or to mothers below the age of 20 or older than 30. The risk of child death escalates as the number of births passes three or four. The infant mortality rate rises for the fifth, sixth, and later children.

Easier access to medical care appears to be one of the reasons that infant mortality is lower in urban than in rural areas. Medical facilities, supplies, and personnel are concentrated in the cities. Many people in rural areas lack health care because there are simply no facilities or trained people within reach. The low mortality in urban areas may be also related to the higher level of education, and higher percentage of households with proper toilet facilities and piped water than in rural areas. The socio-economic differentials in infant and child mortality were more pronounced in urban than rural areas.

Higher maternal and paternal education was associated with lower infant and child mortality. However, if either the mother or the father was uneducated the infant and child mortality remained high. As expected, the infant and child mortality rates were lowest when both parents were educated. The ability to read letters/newspapers and to speak the Indonesian language was highly correlated to low infant and child mortality. These abilities were associated with the educational attainment of respondents. When education becomes universal, the high status associated with education is reduced, while those who lack education may be at a serious disadvantage.

The associations observed between infant and child mortality and the independent variables in this chapter were based on bivariate analyses. However, the gross effects of the variables may be exaggerate or lessened due to the presence of confounding variables. In the following chapter, the effect of the different factors are included in a multivariate framework. The multivariate analysis explores the relationship between the background social characteristics of the parents, intermediate maternal fertility variables, household factors and infant mortality.

# 6

# Effects of proximate determinants on infant mortality

## 6.1 Introduction

In this chapter, Cox regression analysis is employed to observe the effect of demographic, socio-economic and environmental factors on infant mortality. In Chapter Five, the analysis focused on measuring the survival function differentials and the effect on the level of infant and child mortality of a single independent variable. As described in Chapter Two, the Cox regression is a multivariate life table, which takes into account the influence of covariates. With respect to infant mortality, the covariates can influence each other. The coefficients for each variable in the regression model can explain how significant is the effect of the variable on infant mortality after other variables are controlled.

The analysis is mainly based on the 1991 and 1994 Indonesian Demographic and Health Surveys (IDHS). The reference period for the analysis of socio-economic, demographic and household indicators is based on information obtained up to ten years before the surveys. The reference period for the health services related to pregnancy of the mother and birth of the child are based on information obtained up to five years before the surveys. The reason for limiting the analysis to ten years before the survey is to have an adequate number of cases. The data of the respondent's health care with respect to pregnancy and childbirth are only available up to five years before the survey.

Two types of models are used: a univariate model which considers the effect of only one independent variable and a multivariate model which considers the effect of more than one independent variable. The parameter estimates of the univariate model show the effects on infant mortality when the influence of the other variables is not controlled. The multivariate model shows the effects when the influence of the other variables are taken into account. The *Wald* test value and corresponding probability level (*P*) indicates the importance of an association of a particular variable with the infant mortality risk.

The strategy of multivariate analysis in this chapter consists of two parts. Firstly, the analysis examines the effects of the demographic, socio-economic, household characteristics on infant mortality. The three variables will be considered as separate groups. The analysis is also supported by the presentation of tables of relative risk according to the place of residence. Secondly, the analysis examines the effects of a combination of social, bio-demographic and household characteristics on infant mortality. The second part of the analysis is based on the variables which have a significant net effect within each group.

## 6.2 Variables used

The explanatory variables used in this chapter and their respective categories are shown in Table 6.1. The choice of these variables was guided by the literature on determinants of infant and child mortality. The categorisation of the independent variables was based on the empirical findings from previous studies and the distribution of births or exposed children with respect to the different variables. This study implicitly assumed that all covariates remain constant throughout the infant's lifetime.

Socio-economic and household indicators require special comment because they are assumed to be fixed up to the time of the survey. In fact, they may change from one birth to the next or during the lifetime of a particular child. The data that are available relate only to the time of the survey, and therefore the interpretation of the results must be treated accordingly.

### *6.2.1 Demographic factors*

The demographic factors examined in this study are especially related to the maternal characteristics and indices of the children. In the national level analysis, the variables were grouped into respective categories as shown in Table 6.1. At the provincial level analysis, some variables were grouped into fewer categories in order to have enough cases for the analysis.

The analysis was unusual in that the first birth was included in the birth interval analysis. The first birth of the index children was defined as a birth with no preceding birth interval. The demographic characteristics of these children are different to those index children who were born after the birth of other siblings. The first birth of the index child was included in order to compare the difference between those who have no birth interval and those who have short, medium and long birth intervals.

The first birth is also included in the analysis of the survival status of the preceding child. In the survival status of the preceding child variable, the first birth was combined with the previous living child. In this study it is assumed that the survival risk of the first child is the same as children who had a living sibling.

### *6.2.2 Socio-economic factors*

The occupation of the husband in this analysis only covered the primary occupation. In the case of more than one occupation the primary occupation is defined as the one providing the majority of income for the household. Variables related to the husband's information (e.g. education and occupation) collected in the Demographic and Health Surveys are only available for the current husband. Hence the education or occupation of the husband may not be the education or occupation of the biological father of the child if the woman has recently remarried following divorce or widowhood. The husband's education and occupation variables are very important variables that affect infant mortality. These variables can be used as a proxy of household income because the data on household expenditure are unreliable. Fathers who are highly educated are more likely to have a better job and consequently they will have a better income. A father's occupation also reflects the environment where he lives. Children of fathers who are agricultural workers mostly live in rural areas. According to the 1995 Intercensal Survey, 93 per cent of male workers who work in agricultural sectors live in rural areas (CBS, 1996c). Children whose fathers work as professionals or managers mostly live in urban areas.

There are two pieces of information about the place of residence collected in the 1991 and 1994 IDHS, and both refer to the mother: her childhood residence and her current residence. Since many women migrate before having families, the current residence of a mother is a better indicator of the place of the child's birth, and factors that affect survival chances.

The variables regarding the capability of a respondent to read letters and newspapers, whether they read newspapers once a week, and the ownership of a television, are categorised as social and household variables. These variables can be used as indicators of social welfare, and the socio-economic condition of a household.

### *6.2.3 Household facilities*

The household variables (the main materials of the house, the availability of electricity, stove and television) can easily change in a relatively short period of time. The relationship between the covariate factors that describe the situation at the time of the surveys and infant and child mortality rates which occurred before the surveys, is sometimes misleading.

To be a healthy and comfortable house, the house needs to have electricity, safe drinking water, and a privately-owned toilet with a septic tank. It is known that the availability of safe drinking water and the existence of a privately-owned toilet with a septic tank in a housing unit is important for the health of all household members, especially for pregnant mothers and children who are vulnerable to various communicable diseases. According to the 1993 *Susenas* data, 90 per cent of households in urban areas had electricity compared to 39 per cent in rural areas. These figures increased to 95 and 60 per cent in urban and rural areas respectively by 1996 (CBS, 1997).

The source of drinking water and the type of toilet facility constitute hygienic and environmental factors in this study. The information concerning the source of drinking water and toilet facilities existed only at the time of the survey. It is possible that at the time of the survey a household had piped drinking water and an indoor toilet but did not have one when some births occurred. Therefore, exposure to risk and perhaps death may have been attributed to the wrong category. Today's facilities are likely to be more modern, or may have been upgraded after the initial years of child bearing; only deaths in the recent past may correspond to the influences of the facility listed. If in fact mortality declined with more modern toilet facilities and water supplies (an a priori expectation), then the effect estimated for more modern facilities should be negative. However the estimate will be biased upwards, indicating higher mortality risk than is the case, because some children are classified as having modern facilities when actually they were born into less healthy environments. In the three year period (1993-96), the number of households who owned a private toilet with a septic tank increased by 6 per cent; for piped water the increase was 3 per cent (CBS, 1997).

The main material of the house (roof, wall and floor) acts as a proxy for the socio-economic level of a household. It can also be used as a proxy of the health environment and sanitation of a household. Based on the 1993 and 1996 *Susenas,* general housing conditions are getting better. In the period 1993-96, the proportion of houses with inappropriate roof and floor materials, and a small floor area, decreased. Nonetheless, there are many people who live in houses with dirt floors. Further, there are many people who live in small houses of less than 10 square meters per person. In 1996, the proportion of households with dirt floors was still about 22 per cent. Those with a small floor area constituted about 31 per cent (CBS, 1997).

Table 6.1 Independent variables used in the Cox regression analysis

| Demographic variables | Social variables | Household variables | Health care variables |
|---|---|---|---|
| Sex of the child | Place of residence | Ownership of the house | Antenatal care |
| 1. Male | 1. Urban | 1. Own, mortgage | during pregnancy |
| 2. Female | 2. Rural | 2. Rent, contract | 1. Doctor |
| Birth Order | Group of island | 3. Official | 2. Nurse |
| 1. $1^{st}$ birth | 1. Java-Bali | 4. Other | /midwife |
| 2. $2^{nd}$ birth | 2. Sumatra | Main material of the roof | 3. Traditional |
| 3. $3^{rd}$ birth | 3. Kalimantan | 1. Concrete, tile, | birth |
| 4. $4^{th}$ irth | 4. Sulawesi | asbestos,zinc | attendant |
| 5. $5^{th}$ birth | 5. Eastern Indonesia | 2. Wood | Timing of $1^{st}$ |
| 6. $6^{th}$ birth + | Education of mother | 3. Leaves, other | antenatal check |
| Preceding interval | 1. No/some education | Main material of the | 1. 0-3 months |
| 1. First birth | 2. Complete primary | wall | 2. 4-9 months |
| 2. < 19 months | 3. Complete secondary+ | 1. Brick | 3. Never |
| 3. 19-36 months | Education of father | 2. Wood | Antenatal visit |
| 4. > 36 months | 1. No/some education | 3. Bamboo, other | during pregnancy |
| Survival of previous | 2. Complete primary | Main material of the | 1. 1-5 times |
| child | 3. Complete secondary+ | floor | 2. 6-10 times |
| 1. First birth/alive | Ability to read | 1. Ceramic, marble, | 3. > 10 times |
| 2. Death | letter/newspaper | tile | 4. Never |
| Age of mother at | 1. Easily | 2. Wood | Tetanus injection |
| child birth | 2. Not at all, with | 3. Other | during pregnancy |
| 1. < 20 years | difficulty | Source of drinking water | 1. Yes |
| 2. 20-24 years | Read newspaper once a week | 1. Piped | 2. No |
| 3. 25-29 years | 1. Yes | 2. Pump, well | Place of delivery |
| 4. 30-34 years | 2. No | 3. Other | 1. Paramedic |
| 5. 35-39 years | Ability to speak Indonesian | Type of toilet facility | place |
| 6. > 39 years | language | 1. Private with septic | 2. Home |
| Age of mother at | 1. Yes | tank | Assistance at |
| first marriage | 2. No | 2. Private no septic | delivery |
| 1. < 15 years | Occupation of father | tank | 1. Professional |
| 2. 15-19 years | 1. Professional, manager | 3. Shared/Public | paramedic |
| 3. 20-24 years | 2. Clerk | 4. River, stream, pit, | 2. Traditional |
| 4. 25-29 years | 3. Sales/service | bush | birth |
| 5. > 29 years | 4. Industrial worker | Availability of electricity | attendance |
| Birth cohort | 5. Agricultural worker | 1. Yes | Born |
| 1. mid 1984-mid | 6. Never worked | 2. No | 1. On time |
| 1989 | | Ownership and watching | 2. Prematurely |
| 2. mid 1989-mid | | TV | Size of the baby |
| 1994 | | 1. Have TV | 1. Large |
| Number of marriages | | 2. Don't have TV but | 2. Average |
| of mother | | watching TV | 3. Small |
| 1. One | | 3. Don't have TV | |
| 2. More than one | | Ownership of stove | |
| | | 1. Yes | |
| | | 2. No | |

### *6.2.4 Health care factors*

Health care factors used in this study were relevant to maternal and child health. These factors were limited to the antenatal care of the mother during pregnancy, the condition at child birth, and the place and type of assistance for the mother at delivery. In line with the maternal and child health program, the Indonesian government has improved health care services by providing health centres in every subdistrict (*kecamatan*). These health centers place strong emphasis on maternal and child health services. To make the health care facilities more accessible, *Puskesmas, Pustu* and *Posyandu* as mentioned in Chapter Three, have been established.

The analysis of these health care variables compares mortality differences according to the utilisation of modern and traditional health care services. The data available for this analysis were limited to children born five years preceding the surveys. Antenatal care during pregnancy was classified into three categories. The first two categories (doctor and nurse or midwife) represent modern trained health personnel, while the last category represented the traditional birth attendant. Although women reported all sources from whom they obtained antenatal care, in this analysis, the evaluation of medical care for early detection of high-risk pregnancies is based on the most qualified providers.

Women during their first pregnancy were recommended to have two immunisations against tetanus. Booster injections are given once during each subsequent pregnancy to maintain full protection. In recent years, tetanus toxoid immunisation was also given to women before marriage so that any pregnancy occurring within three years of the wedding would be protected against tetanus. This program is coordinated by the Expanded Program of Immunisation (EPI) and the Maternal and Child Health care (MCH) unit of the Ministry of Health (MOH). The coverage of immunisation of pregnant women against tetanus steadily increased from 37 per cent in 1988/89 to 64 per cent in 1992/93 (MOH, 1994a). The 1991 and 1994 IDHS collected data on pregnant women who had been given tetanus injections up to five years before the survey. This information may be unreliable. Women may have difficulty remembering if they had had an injection before their child's birth. Moreover, the women may confuse a tetanus injection with other kinds of injection given in that period.

Assistance at deliveries, such as doctors and midwives, were categorised as professional paramedic, while traditional birth attendants (*dukun bayi*), relatives and others were categorised as traditional birth attendance (TBA). When the delivery was assisted by more than one assistance delivery specialist (i.e. doctors, midwives and *dukun bayi*), then the least qualified was recorded, since the person was usually the first choice to assist during delivery. Only complicated cases are referred to the more qualified attendants (CBS, 1995a). However, if the delivery was attended by the delivery specialist and relatives or other persons, then the delivery specialist was recorded. According to the 1996 *Susenas*, half of the births in Indonesia were attended by professional birth attendants and another half by non-medical birth attendants (CBS, 1997). The levels depend highly on the place of residence; in urban areas the majority of births (79 per cent) were attended by medical personnel, especially midwives, while in rural areas 64 per cent were attended by non-medical birth attendants especially *dukun bayi.*

The best predictor of an infant's survival is its weight at birth. Low birth weight is viewed in both developed and less developed countries as a major cause of infant mortality. As most deliveries attended by the *dukun bayi* were at home they were not weighed. In this study, the analysis employed the baby's size instead of the baby's weight at birth. The size of newborn babies in the 1994 IDHS was dependent on the respondent's perceptions (not an accurate scale). In addition, the 1994 IDHS reported that younger aged and non-educated mothers were more likely to report that their babies were smaller than average (CBS, 1995a). Another proximate predictor of a baby's weight is the immaturity stated by the respondents. There are two kinds of immaturity. One results from the baby being born prematurely, before its full nine months in the womb are complete. The other occurs when a full-term infant has not grown sufficiently during gestation.

## 6.3 The effects of demographic factors

The analysis incorporated eight variables, sex of the child, birth order, preceding birth interval, survival status of preceding child, age of mother at child birth and at first marriage, birth cohort, and the number of times the mother had married. Table 6.2 presents the relative survival risk for infants according to univariate and multivariate analyses of the 1991 and 1994 IDHS. Table 6.3. using only the 1994 IDHS, presents the relative risk of infant mortality according to differentials by place of residence.

Table 6.2 clearly demonstrates that the length of the preceding birth interval and the survival status of the preceding child were the most crucial demographic factors in determining the survival chance of the index child. The effects were consistent in univariate and multivariate analyses from both data sets. The differences between urban and rural areas were not significant as demonstrated in Table 6.3. The findings showed that children born after a longer birth interval experienced a lower risk. This is not unexpected because mortality during infancy is more related to the mother's physical condition, and once the child passes infancy the family's household and environmental conditions are likely to exert a greater influence on its survival. A child born after a longer interval is likely to have better family care, and so a better chance of survival after the critical infancy stage.

The first birth and the medium preceding birth interval of children (19-36 months) have only half the risk of dying during infancy than those with a short preceding birth interval (< 19 months). Furthermore, those with a long preceding birth interval (> 36 months) have three times the chance of living during infancy than those children born with a short birth interval.

Table 6.2 The relative risk of demographic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Sex of the child | | 21.9*** | | 20.4*** | | 33.7*** | | 34.8*** |
| Male | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Female | 0.82*** | | 0.83*** | | 0.79*** | | 0.78*** | |
| Birth Order | | 41.0*** | | 49.8*** | | 94.8*** | | 63.9*** |
| 1st birth | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 2nd birth | 0.89 | | 1.43*** | | 0.94 | | 1.52*** | |
| 3rd birth | 0.98 | | 1.75*** | | 0.98 | | 1.71*** | |
| 4th birth | 0.91 | | 1.61*** | | 0.99 | | 1.71*** | |
| 5th birth | 1.02 | | 1.75*** | | 1.24** | | 2.05*** | |
| 6th birth + | 1.32*** | | 1.96*** | | 1.58*** | | 2.31*** | |
| Preceding interval | | 372.8*** | | 209.9*** | | 386.2*** | | 207.6*** |
| First birth | 0.47*** | | a | | 0.43*** | | a | |
| < 19 months | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 19-36 months | 0.46*** | | 0.54*** | | 0.50*** | | 0.58*** | |
| > 36 months | 0.30*** | | 0.37*** | | 0.30*** | | 0.37*** | |
| Survival of previous child | | 476.7*** | | 264.5*** | | 445.1*** | | 219.0*** |
| First birth/alive | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Death | 2.97*** | | 2.44*** | | 2.91*** | | 2.26*** | |
| Age of mother at child birth | | 99.3*** | | 39.9*** | | 44.3*** | | 14.5* |
| < 20 years | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 20-24 years | 0.64*** | | 0.71*** | | 0.77*** | | 0.85* | |
| 25-29 years | 0.57*** | | 0.67*** | | 0.68*** | | 0.75** | |
| 30-34 years | 0.63*** | | 0.71** | | 0.77*** | | 0.78* | |
| 35-39 years | 0.75*** | | 0.81 | | 0.91 | | 0.86 | |
| > 39 years | 0.89 | | 0.99 | | 1.01 | | 0.94 | |
| Age of mother at first marriage | | 83.3*** | | 19.8*** | | 97.7*** | | 26.7*** |
| < 15 years | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 15-19 years | 0.81*** | | 0.88* | | 0.73*** | | 0.83** | |
| 20-24 years | 0.58*** | | 0.73*** | | 0.54*** | | 0.68*** | |
| 25-29 years | 0.48*** | | 0.59*** | | 0.53*** | | 0.70** | |
| > 29 years | 0.64 | | 0.69 | | 0.80 | | 0.93 | |
| Birth cohort | | 8.2** | | | | 23.7*** | | |
| 5 - 10 years before survey | 1.00 | | - | | 1.00 | | - | |
| 5 years before survey | 0.89** | | - | | 0.82*** | | - | |
| Number of times the mother has married | | 30.1*** | | 12.8*** | | 42.2*** | | 17.3*** |
| Once | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| More than once | 1.40*** | | 1.26*** | | 1.51*** | | 1.32*** | |

Source: Primary analysis of the 1991 and 1994 IDHS using the Cox regression proportional hazard model.

Note : RR Relative risks

a Linearly dependent covariate with first birth order

\- Excluded in the multivariate model

*W* Wald test

* Significant at the five per cent level

** Significant at the one per cent level

*** Significant at the 0.1 per cent level

There are three explanations regarding the association of short birth intervals and high mortality: a) competition between siblings close in age for limited maternal resources; b) increased disease transmission in households with more than one small child; c) physical and nutritional depletion of the mother by repeated frequent childbearing (Winikoff and Castle, 1987).

Table 6.2 shows that, in an univariate analysis, children whose previous sibling died are almost three time more likely to die during infancy than first-born children or those whose previous sibling survived. Using a multivariate analysis, children whose previous sibling had died were 2.4 times and 2.3 times more likely to die than first born children or children whose sibling was alive in the 1991 and 1994 IDHS respectively.

The death of a previous sibling tends to shorten the interval of the next conception (Preston, 1978). The cessation of breastfeeding leads to an early return to fecundity. This is possibly also due to a desire to replace the dead child. In addition, the effect of a short interval on the next child's mortality may depend on the survival status of the preceding child. If the preceding child died, a short interval may not be disadvantageous, as there is no competition between closely-spaced siblings. Aaby (1989) found that measles mortality was related to the severity of infection. The risk increased because of the greater exposure to pathogens which thrive in crowded conditions.

In Tables 6.2 and 6.3, the relative risks in the univariate analysis indicate that only birth order six and above in the 1991 IDHS, and birth order five and above in the 1994 IDHS, were significantly higher with respect to the first birth order infant mortality. However, birth order appears to have a significant influence when the effects of other factors, especially maternal age, are controlled. After controlling the place of residence, the differences were only significant in rural areas (Table 6.3). This means that the higher risk of first children dying observed in the univariate analysis is due to the young age of the mother giving birth for the first time, especially

Table 6.3 The relative risk of demographic factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS

| Variable | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Sex of the child | | 16.9*** | | 16.6*** | | 19.9*** | | 21.3*** |
| Male | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Female | 0.65*** | | 0.65*** | | 0.82*** | | 0.81*** | |
| Birth Order | | 23.4*** | | 16.4** | | 58.8*** | | 74.4*** |
| 1st birth | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 2nd birth | 0.90 | | 1.41 | | 0.94 | | 1.45*** | |
| 3rd birth | 0.84 | | 1.33 | | 0.99 | | 1.58*** | |
| 4th birth | 0.77 | | 1.14 | | 1.00 | | 1.55*** | |
| 5th birth | 1.23 | | 1.72* | | 1.18 | | 1.75*** | |
| 6th birth + | 1.67*** | | 2.03*** | | 1.48*** | | 2.01*** | |
| Preceding interval | | 57.1*** | | 35.6*** | | 319.2*** | | 200.0*** |
| First birth | 0.47*** | | a | | 0.43*** | | a | |
| < 19 months | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 19-36 months | 0.50*** | | 0.57*** | | 0.50*** | | 0.58*** | |
| > 36 months | 0.31*** | | 0.38*** | | 0.31*** | | 0.37*** | |
| Survival of previous child | | 70.8*** | | 39.4*** | | 341.6*** | | 174.7*** |
| First birth/alive | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Death | 3.26*** | | 2.59*** | | 2.73*** | | 2.19*** | |
| Age of mother at child birth | | 17.4** | | | | 24.9*** | | |
| < 20 years | 1.00 | | - | | 1.00 | | - | |
| 20-24 years | 0.72* | | - | | 0.80** | | - | |
| 25-29 years | 0.59** | | - | | 0.73*** | | - | |
| 30-34 years | 0.60** | | - | | 0.83* | | - | |
| 35-39 years | 0.69 | | - | | 0.96 | | - | |
| > 39 years | 1.42 | | - | | 0.95 | | - | |
| Age of mother at first marriage | | 23.9*** | | 18.0** | | 54.3*** | | 32.7*** |
| < 15 years | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 15-19 years | 0.88 | | 0.95 | | 0.73*** | | 0.79*** | |
| 20-24 years | 0.52*** | | 0.58** | | 0.61*** | | 0.67*** | |
| 25-29 years | 0.59* | | 0.64 | | 0.60*** | | 0.68** | |
| > 29 years | 0.81 | | 0.84 | | 0.90 | | 0.95 | |
| Birth cohort | | 4.6* | | | | 18.7*** | | |
| 5 - 10 years before survey | 1.00 | | - | | 1.00 | | - | |
| 5 years before survey | 0.80* | | - | | 0.82*** | | - | |
| Number of times the mother has married | | 6.9** | | | | 28.8*** | | 12.8*** |
| Once | 1.00 | | - | | 1.00 | | 1.00 | |
| More than once | 1.58** | | - | | 1.44*** | | 1.28*** | |

Source: Primary analysis of the 1994 IDHS using the Cox regression proportional hazard model.

Note : RR Relative risks

a Linear dependent covariate with first birth order

- Excluded in the multivariate model

*W* Wald test

* Significant at the five per cent level

** Significant at the one per cent level

*** Significant at the 0.1 per cent level

among women in rural areas. When mothers are older, the risk to first children is actually lower than for higher order births (Hull and Gubhaju, 1986: 109-118). The focus on parity and maternal age reinforces the lesson which is already being promoted by the Indonesian Family Planning Programme.

The apparent influence of maternal age at child bearing in the univariate analysis loses significance in the multivariate model, especially when using the 1994 IDHS, on account of its association with other risk factors, e.g. low birth weight with shorter prior birth interval and younger maternal age. This has also been observed by Hull and Gubhaju (1986) based on the Indonesia World Survey data.

This study consistently found that there was a greater risk of infant mortality related to young maternal age, although there was little evidence of excess risk for the first born children of young mothers. This pattern also appears in some detailed analysis of particular countries, including Indonesia, Pakistan and the Philippines (Martin et al. 1983), Sri Lanka (Trussell and Hammerslough, 1983), Indonesia (Hull and Gubhaju, 1986) and Nepal (Gubhaju, 1986). Preston (1985) suggested that this pattern could be a recall bias; mothers may omit deceased first born children. However, after controlling the place of residence, the maternal age at child bearing variable disappeared from the multivariate model (Table 6.3). This means that differentials in maternal age at child bearing were not important factors in reducing infant mortality within urban or rural areas in Indonesia.

Between 1991 and 1994, the median age at first marriage increased from 17.7 to 18.1 years among mothers aged 25-49. Urban women marry at least two years later than their rural counterparts (CBS, 1992a, 1995a). Table 6.2 shows that children born to women who marry at a young age (< 15 years) have a higher risk of dying compared to women who first marry in older age groups. The results are insignificant for women whose age at first marriage is 30 years and over; this may be due to a small sample size (Table A.6.8). The differentials of a women's age at first marriage were more pronounced in rural than urban areas (Table 6.3).

The sex of the index child shows the usual pattern, males appearing to have a higher risk of dying during infancy than females; the difference remains significant for both surveys. The estimates in both univariate and multivariate models show the usual sex differential in infant mortality that is due to biological factors. The multivariate model indicates that a female child is exposed to a 17 and 22 per cent lower chance of dying than a male child using the 1991 and 1994 IDHS respectively. Furthermore, female children born in urban areas are 35 per cent less likely to die during infancy, while in rural areas the figure is 19 per cent. The *Wald* test values show the difference to be statistically significant, the corresponding probability level establishing sex as an important factor influencing infant mortality in Indonesia.

The birth cohort of the child has a significant effect in the univariate analysis on infant mortality. The birth cohort is insignificant in the multivariate analysis and therefore it is not included in the model. Children who were born five years before the 1991 IDHS were 11 per cent less likely to die during infancy than those who were born five to ten years before the 1991 survey. Furthermore, children who were born five years before the 1994 IDHS were 18 per cent less likely to die during infancy than those who were born five to ten years before the 1994 survey. These figures confirmed the result in Chapter Four that the level of infant mortality in Indonesia was declining.

A woman may remarry because she have been divorced or because her husband has died. The number of times a mother marries contributes to a decline in the risk of infant mortality. Ten per cent of women in the 1991 IDHS were married more than once, while in the 1994 IDHS the figure was only eight per cent (Table A.6.8). Table 6.2 shows that the difference between children born to mothers married only once and mothers married more than once is highly significant in both the univariate and multivariate analysis. In the univariate analysis, the difference of the risk of dying between children born to mothers who married only once, and mothers who married more than once was 40 per cent and 51 per cent for the 1991 and 1994 IDHS respectively. However, after controlling the place of residence the effect of the variable on the multivariate model disappeared in urban areas but remained in rural areas (Table 6.3).

## 6.4 The effects of regional factors

Table 6.4 shows the relative risks of mortality according to regional factors including place of residence, group of island and the ability of respondents to speak the Indonesian language. Urban/rural residence differentials have been studied, with urban areas displaying a greater chance of childhood survival. The difference remains significant even after controlling the effects of other variables. This is partially because of the higher concentration of medical facilities in urban areas. These finding are consistent with the 1976 WFS data (Hull and Gubhaju, 1986).

With respect to infant mortality the difference between Java-Bali islands and other islands were more significant in 1991 than in 1994, especially in the multivariate model. Children born to women in the eastern Indonesian islands (1991 IDHS) had a significantly higher risk of infant mortality compared to those born in the Java-Bali islands using both univariate and multivariate analyses. However in the 1994 IDHS, the differences were significant only in the univariate analysis. This may be because of the development of socio-economic factors, especially the education of the mother. Further the development of health facilities in the eastern Indonesian islands between 1991 and 1994 may have influenced infant mortality.

There is no doubt that poorer and more isolated provinces lag behind the rest of Indonesia in many aspects of development. The Indonesian government since the early 1990s has given top priority to development of the area of eastern Indonesia (*Kawasan Timur Indonesia* [KTI]) (Jones, 1995). Recently, a team of 12 cabinet ministers was set up to formulate the strategy to development and invest in this area. The businessmens' group in a seminar in Jakarta stated that KTI needed a special minister (Kompas, 10 September 1997). In recent years, development in many sectors and studies tended to concentrate effort in the eastern island provinces, especially East

Table 6.4 The relative risk of regional factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Place of residence | | 69.5*** | | 60.4*** | | 100.1*** | | 78.3*** |
| Urban | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Rural | 1.54*** | | 1.51*** | | 1.74*** | | 1.66*** | |
| Group of island | | 57.3*** | | 44.7*** | | 20.9*** | | 10.0* |
| Java-Bali | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Sumatra | 0.95 | | 0.86** | | 1.09 | | 1.00 | |
| Kalimantan | 1.22*** | | 1.10 | | 1.29*** | | 1.19* | |
| Sulawesi | 0.98 | | 0.88 | | 1.24** | | 1.13 | |
| Eastern Indonesia | 1.43*** | | 1.26*** | | 1.23** | | 1.05 | |
| Ability to speak Indonesian language | na | na | na | na | | 27.8*** | | 12.5*** |
| Yes | | | | | 1.00 | | 1.00 | |
| No | | | | | 1.32*** | | 1.22*** | |

Source: Primary analysis of the 1991 and 1994 IDHS, using the Cox regression proportional hazard model.

Note : RR Relative risks
na Not available in 1991 IDHS
*W* Wald test
* Significant at the five per cent level
** Significant at the one per cent level
*** Significant at the 0.1 per cent level

and West Nusa Tenggara and East Timor. Funding mostly came from international agencies such as AusAID (Australian Agency for International Development) and USAID (United State Agency for International Development) and international bodies such as UNICEF, WHO and UNDP (United Nations Development Program). The AusAID's priority sectors in the eastern islands of Indonesia are education, health, environment, water supply and sanitation, and rural development. AusAID projects in the eastern islands include: an environmental sanitation and water supply project[5]; improving the reproductive health of low-income women project[6]; the Alor community

[5] This project was conducting in NTB (NTB environmental sanitation and water supply project), East Timor (East Timor water supply and sanitation project) and Flores (Flores water supply & sanitation reconstruction & development)

[6] This project was conducting in East and West Nusa Tenggara, the aim of this project is to increase and continuing use of appropriate family planning method for women of low income and minimal education.

Table 6.5 The relative risk of regional factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS

| Variable | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | W | RR | W | RR | W | RR | W |
| Group of island | | 7.5 | | | | 5.5 | | |
| Java-Bali | 1.00 | | - | | 1.00 | | - | |
| Sumatra | 1.02 | | - | | 0.93 | | - | |
| Kalimantan | 1.35 | | - | | 1.09 | | - | |
| Sulawesi | 1.37 | | - | | 1.04 | | - | |
| Eastern Indonesia | 1.29 | | - | | 1.01 | | - | |
| Ability to speak Indonesian language | | 25.3*** | | | | 5.6* | | |
| Yes | 1.00 | | - | | 1.00 | | - | |
| No | 2.41*** | | - | | 1.14* | | - | |

Source: Primary analysis of the 1994 IDHS, using Cox regression proportional hazard model.
Note : RR Relative risks
- Excluded in the multivariate model

W Wald test

* Significant at the five per cent level

** Significant at the one per cent level

*** Significant at the 0.1 per cent level

health project[7]; Jayawijaya Watch project[8]; population related research for development planning and development assistance in Indonesia[9] (AusAID, 1996, 1997).

The group of islands differences are insignificant after controlling the place of residence (Table 6.5). This means there is no significant difference in terms of health services and environmental conditions between the different groups of islands. The difference in the ability of mothers to speak Indonesian is significant with respect to the survival chances of their children, even after controlling the place of residence (Table 6.4). Mothers who are able to speak the Indonesian language claim that they had attended a formal school, or they had more interaction with other people in their daily life (such as traders or those who worked in informal sectors). Some regions such as the Riau Islands in Sumatra use the Indonesian language as the main spoken language.

---

[7] The project intended to improve of life in selected communities in Alor, East Nusa Tenggara lead to reduced mortality and morbidity and to increased the effectiveness of local health services.

[8] The major objective of the project is to improve community health, especially the health of women and their children in rural communities in Jayawijaya.

[9] This project provide input and recommendations to other relevant projects. The focus of the project is evaluating demographic trends, especially population growth related to health, fertility and family planning and levels and trends in poverty.

The mortality risk of children in urban areas of mothers who are unable to speak Indonesian is 2.4 times greater than for those whose mothers are able to speak Indonesian. In rural areas the difference was only 1.14 times (Table 6.5). As discussed in Chapter Five in urban areas children of mothers who are unable to speak Indonesian had the highest risk of dying. Usually these parents have a low income and live in slum areas with inappropriate sanitation and environment.

## 6.5 The effects of socio-economic factors

The socio-economic factors considered include parental education, a respondent's ability to read letters/newspapers, whether a respondent reads a newspaper once a week, father's occupation, ownership of the house, the availability of electricity, and the possession of a television and a stove. The effect of socio-economic factors on infant mortality is examined separately for urban and rural areas in Tables 6.7 and 6.9 using the 1994 IDHS.

Table 6.6 shows that the education of both mother and father had a significant affect in reducing infant mortality. An increase in the educational status of parents leads to a decline in infant mortality. However, the effect of education on child mortality is not simple or direct. It has been argued that children die not because their mothers (or even fathers) do not go to school but because they receive insufficient or inappropriate food, or are taken to medical services too late when they are ill (Ware, 1984). There is also a complex interaction between education and income in matters relating to child care. While one of the obvious explanations of the relationship between a mother's education and a child's survival is that schooling enhances knowledge about effective ways to prevent, recognise and treat childhood disease. The influence of a father's education is largely due to his social-economic status (Hull and Gubhaju, 1986). Higher social status is likely to be related to better nutrition, household sanitation and personal hygiene, all of which may reduce infant mortality (Oni, 1988).

Table 6.6 The relative risk of socio-economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Education of mother | | 150.6*** | | 10.3** | | 184.1*** | | 22.2*** |
| Complete secondary + | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Complete primary | 2.21*** | | 1.32** | | 1.67*** | | 1.40*** | |
| No education/some | 3.09*** | | 1.34** | | 2.54*** | | 1.66*** | |
| Education of father | | 182.7*** | | 30.3*** | | 171.0*** | | 15.7*** |
| Complete secondary + | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Complete primary | 1.82*** | | 1.35*** | | 1.55*** | | 1.15 | |
| No education/some | 2.26*** | | 1.53*** | | 2.20*** | | 1.35*** | |
| Ability to read letter/newspaper | | 115.0*** | | 9.6** | | 147.1*** | | 8.2** |
| Easily | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| With difficulty/not at all | 1.57*** | | 1.19** | | 1.64*** | | 1.18** | |
| Read newspaper once a week | | 99.8*** | | | | 70.7*** | | |
| Yes | 1.00 | | - | | 1.00 | | - | |
| No | 1.78*** | | - | | 1.60*** | | - | |
| Father's occupation | | 123.6*** | | 22.6*** | | 112.0*** | | 15.7** |
| Professional, manager | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Clerk | 0.99 | | 0.95 | | 1.15 | | 1.12 | |
| Sales/service | 2.10*** | | 1.44** | | 1.44*** | | 1.04 | |
| Industrial worker | 1.90*** | | 1.28 | | 1.58*** | | 1.09 | |
| Agriculture worker | 2.53*** | | 1.49** | | 2.08*** | | 1.25* | |
| Never work | 3.07*** | | 2.21** | | 2.20*** | | 1.47* | |

Source: Primary analysis of the 1991 and 1994 IDHS, using Cox regression proportional hazard model.

Note : RR Relative risks
- \- Excluded in the multivariate model
- *W* Wald test
- * Significant at the five per cent level
- ** Significant at the one per cent level
- *** Significant at the 0.1 per cent level

Using univariate estimates (1991 IDHS) in Table 6.6 infants born to mothers with no education were three times more likely to die during infancy than those infants born to mothers who completed at least a secondary education; this dropped to 2.5 times in the 1994 IDHS. In the multivariate model the differences decreased after other factors were controlled. However, children born to mothers with no education or a complete primary school have a higher risk of dying during infancy than those born to mothers with a completed secondary school education. Table 6.7 shows that, even after controlling the place of residence variables, the effect of a mother's education remained important in reducing infant mortality while the effect of father's education was only important in rural areas. Well-educated women probably have

Table 6.7 The relative risk of socio economic factors contributing to infant mortality according to the place of residence, Indonesia, 1994 IDHS

| Variable | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | W | RR | W | RR | W | RR | W |
| Education of mother | | 58.8*** | | 19.9*** | | 80.31*** | | 13.5** |
| Complete secondary + | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Complete primary | 1.30 | | 1.29 | | 1.57*** | | 1.43** | |
| No education/some | 2.52*** | | 2.09*** | | 2.15*** | | 1.62*** | |
| Education of father | | 43.17*** | | | | 74.9*** | | 13.0** |
| Complete secondary + | 1.00 | | - | | 1.00 | | 1.00 | |
| Complete primary | 1.61*** | | - | | 1.31** | | 1.07 | |
| No education/some | 2.40*** | | - | | 1.77*** | | 1.28** | |
| Ability to read letter/newspaper | | 15.0*** | | 3.9* | | 66.0*** | | 6.3* |
| Easily | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| With difficulty/not at all | 1.50*** | | 1.34* | | 1.44*** | | 1.16* | |
| Read newspaper once a week | | 47.9*** | | | | 19.8*** | | |
| Yes | 1.00 | | - | | 1.00 | | - | |
| No | 2.12*** | | - | | 1.36*** | | - | |
| Father's occupation | | 23.6*** | | | | 33.0*** | | |
| Professional, manager | 1.00 | | - | | 1.00 | | - | |
| Clerk | 1.36 | | - | | 1.12 | | - | |
| Sales/service | 1.54* | | - | | 1.44** | | - | |
| Industrial worker | 1.76** | | - | | 1.48** | | - | |
| Agriculture worker | 2.52*** | | - | | 1.69*** | | - | |
| Never work | 2.67** | | - | | 1.90*** | | - | |

Source: Primary analysis of the 1994 IDHS, using the Cox regression proportional hazard model.
Note : RR Relative risks
- Excluded in the multivariate model
W Wald test
* Significant at the five per cent level
** Significant at the one per cent level
*** Significant at the 0.1 per cent level

easier access to information on nutrition and health care, and are better able to act on advice. Education may also help in the implementation of medical advice, such as the use of oral salts to prevent dehydration in case of diarrhoea. As such, education enhances the efficiency of the process of producing surviving children.

The ability of a mother to read letters or newspapers is highly related to their education attainment. The mother's ability to read letters or newspapers has a significant effect in reducing infant mortality using the univariate and multivariate analyses. Even after the place of residence is controlled, the effect of this factor remains important.

The father's occupation in Table 6.6 refers to the situation at the time of the survey. This means that some people may not be employed in the same jobs as when their child died. In spite of this limitation, however, it is believed that this variable can be used as a proxy for the socio-economic status of families. Children whose fathers are employed as a professional, manager or clerk had the highest survival advantage; the most disadvantageous were those children who had fathers that didn't work. However after place of residence was controlled, the effect of a father's occupation was insignificant and therefore excluded from the multivariate analysis. This means that within urban and rural areas, the difference in a father's occupation was not important in reducing infant mortality.

The ownership of the house variable is only available in the 1994 IDHS data set. The households who owned or had mortgaged their house were the most numerous in the sample (Table A.6.11). The ownership of the house should be an appropriate proxy for the socio-economic status of the household. However, the results were unexpected. Children who live in official, rented or contract houses had a higher chance of survival during infancy than those who live in their own or mortgaged house. The significant difference is shown in the univariate and multivariate analyses. The most advantageous was those children who lived in official houses; they were 31 per cent less likely to die during infancy after other variables were controlled. However, after the place of residence was controlled, the significant effect of house ownership only appeared in rural areas, especially the official house. The number of official houses is very limited, therefore, households who occupied official houses are mostly those who have a better position and education in their company. Official houses usually have piped water and proper sanitation. Respondents who stay in rented or contract house are usually young families who had experience lower mortality than the older families. They also tend to have a higher level of education.

Table 6.8 The relative risk of socio-economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Ownership of the house | na | na | na | na | | 45.6*** | | 16.1** |
| Own, mortgage | | | | | 1.00 | | 1.00 | |
| Rent, contract | | | | | 0.60*** | | 0.74** | |
| Official | | | | | 0.54*** | | 0.69** | |
| Other | | | | | 1.02 | | 1.07 | |
| Availability of electricity | | 86.9*** | | 13.5*** | | 71.1*** | | 4.6* |
| Yes | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| No | 1.50*** | | 1.21*** | | 1.42*** | | 1.12* | |
| Television | | 123.8*** | | 61.1*** | | 97.3*** | | 28.5** |
| Have TV | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Doesn't have TV but watch TV | 1.82*** | | 1.66*** | | 1.63*** | | 1.38*** | |
| Doesn't have and watch TV | 1.78*** | | 1.55*** | | 1.52*** | | 1.21** | |
| Ownership of stove | | 42.0*** | | | | 79.9*** | | 7.2** |
| Yes | 1.00 | | - | - | 1.00 | | 1.00 | |
| No | 1.34*** | | - | - | 1.50*** | | 1.17** | |

Source: Primary analysis of the 1991 and 1994 IDHS, using the Cox regression proportional hazard model.

Note : RR Relative risks
na Not available in the 1991 IDHS data set
- Excluded in the multivariate model
*W* Wald test
* Significant at the five per cent level
** Significant at the one per cent level
*** Significant at the 0.1 per cent level

The availability of electricity in the household had a significant effect on infant mortality in the 1991 IDHS, although less significant in the net effect of the 1994 IDHS. This is may be because the government program of *listrik masuk desa* (village electrification) has been successful, and many poor households in rural areas now have electricity.

The ownership of a television had a significant effect in reducing infant mortality. However, the relative risk difference between children of mothers who watched television and those who didn't watch television was insignificant. In the 1991 univariate analysis, children of mothers who didn't have television but watched television were 82 per cent more likely to die during infancy than those mothers who had television: in 1994 the figure was 63 per cent. This is maybe because mothers who did not have television only watched films, plays or comedies for entertainment.

Table 6.9 The relative risk of socio-economic factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS

| Variable | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | Gross effects | | Net effects | | Gross effects | | Net effects | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Ownership of the house | | 3.1 | | | | 21.2$^{***}$ | | 15.8$^{**}$ |
| Own, mortgage | 1.00 | | - | | 1.00 | | 1.00 | |
| Rent, contract | 0.84 | | - | | 0.74 | | 0.76 | |
| Official | 0.76 | | - | | 0.52$^{***}$ | | 0.58$^{**}$ | |
| Other | 0.87 | | - | | 1.18 | | 1.17 | |
| Availability of electricity | | 10.5$^{**}$ | | | | 11.0$^{***}$ | | |
| Yes | 1.00 | | - | | 1.00 | | - | |
| No | 1.66$^{**}$ | | - | | 1.17$^{***}$ | | - | |
| Television | | 17.8$^{***}$ | | 9.14$^{*}$ | | 26.9$^{***}$ | | 20.1$^{***}$ |
| Have tv | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Doesn't have tv but watch tv | 1.58$^{***}$ | | 1.45$^{**}$ | | 1.39$^{***}$ | | 1.34$^{***}$ | |
| Doesn't have/watch tv | 1.49$^{*}$ | | 1.26 | | 1.25$^{***}$ | | 1.20$^{**}$ | |
| Ownership of stove | | 17.4$^{***}$ | | 7.9$^{**}$ | | 6.7$^{**}$ | | |
| Yes | 1.00 | | 1.00 | | 1.00 | | - | |
| No | 1.65$^{***}$ | | 1.45$^{**}$ | | 1.16$^{**}$ | | - | |

Source: Primary analysis of the 1994 IDHS, using Cox regression proportional hazard model.
Note : RR Relative risks
na Not available in the 1991 IDHS data set
\- Excluded in the multivariate model
*W* Wald test
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

They are less likely to watch the government information programs including those related to health care.

To investigate the effects of television programs on infant and child mortality would require a further study. Television in this survey is only good as a proxy of wealth rather than a method to improve a respondent's health care knowledge. According to CBS data, 69 per cent of the population watched television in 1994. Television is a good medium that the government can use to promote health care programs especially immunisation and environmental awareness. Table 6.9 shows that after place of residence was controlled, the impact of the ownership of a television remained important.

In the 1991 IDHS the relative risk of infant mortality with respect to the ownership of a stove was significant in the univariate analysis but insignificant in the multivariate analysis and therefore excluded from the model. However, in the 1994 IDHS the relative risk difference was significant in both the univariate and multivariate analyses. This may be due to the influence of the ownership of the house variable. However, after controlling the place of residence variables, the effect of the ownership of a stove is only important in urban areas.

## 6.6 The effects of housing factors

A complete list of housing indicators is only available in the 1994 IDHS. The indicators in this analysis include the main material of the floor, roof and the wall, and the type of the house, a new 'construction' variable which is the result of combining the three housing indicators.

In the 1991 IDHS the only variable available was the main material of the floor. The main material of the house variable can be a measure of the wealth status of a household. It can also be used as a proxy of sanitation, especially the main material of the floor. In the univariate analysis, all of the variables had a highly significant influence on infant mortality risk. However, their effect were less significant in the multivariate model. This may be because house material may not be a suitable measure to determine the wealth of a household. The type and material of houses in Indonesia varies depending on the region or tribe of the people. Therefore, the type and material of the house will be valuable if examined within a province.

Table 6.11 shows that after controlling the place of residence, the effect of house materials is less significant within urban and rural areas. The main material of the roof and the type of the house was insignificant in the multivariate analysis and therefore excluded from the model. Regarding the main material of the wall, the most disadvantageous were children who lived in a house with bamboo (or other) as the main material of the wall. In urban areas, children who lived in bamboo walled houses were 86 per cent more likely to die during infancy than those who lived in a brick walled house: in rural areas the figure was 26 per cent.

Table 6.10 The relative risk of housing factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Main material of the floor | | 83.0*** | na | na | | 57.3*** | | 24.9*** |
| Tile/ceramic | 1.00 | | | | 1.00 | | 1.00 | |
| Concrete, brick | 1.43*** | | | | 1.91* | | 1.79* | |
| Bamboo/wood | 1.94*** | | | | 2.62*** | | 1.63 | |
| Other | 1.86*** | | | | 2.03** | | 1.33 | |
| Main material of the roof | na | na | na | na | | 55.5*** | | 6.8* |
| Concrete, tile, asbestos, zinc | | | | | 1.00 | | 1.00 | |
| Wood | | | | | 1.23* | | 1.02 | |
| Leaves, other | | | | | 1.39*** | | 1.14* | |
| Main material of the wall | na | na | na | na | | 76.7*** | | 15.7*** |
| Brick | | | | | 1.00 | | 1.00 | |
| Wood | | | | | 1.34*** | | 0.80 | |
| Bamboo, other | | | | | 1.60*** | | 0.98 | |
| House type | na | na | na | na | | 79.6*** | | 9.6** |
| Type I | | | | | 1.00 | | 1.00 | |
| Type II | | | | | 1.24*** | | 1.33* | |
| Type III | | | | | 1.54*** | | 1.82** | |

Source: Primary analysis of the 1994 IDHS, using the Cox regression proportional hazard model.
Note : RR Relative risks
na Not available in 1991 data set
- Excluded in the multivariate model
*W* Wald test
* Significant at the five per cent level
** Significant at the one per cent level
*** Significant at the 0.1 per cent level

House type
Type I: Floor: Tile/ceramic/concrete
Wall : Brick
Roof : Concrete/tile/asbestos/zinc
Type II: Floor: Concrete/dirt/other
Wall : Brick/bamboo/other
Roof : Concrete/tile/asbestos/zinc
Type III: Floor: Concrete/dirt/other
Wall : Bamboo/other
Roof : Leaves/other

Table 6.10 shows that children who live in house type III had 54 per cent (univariate analysis) and 82 per cent (multivariate analysis) more risk of dying during infancy than those who live in house type I. Children who live in house type II were 24 and 33 per cent more likely to die during infancy than those who live in house type I. However, after controlling the place of residence, the difference between those who live in house type I and type II in rural areas was insignificant, and the risk of dying in house type II and type III, in urban areas was similar.

Table 6.11 The relative risk of housing factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS

| Variable | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Main material of the floor | | 15.4** | | 11.6** | | 21.9*** | | 15.2** |
| Tile/ceramic | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Concrete, brick | 2.22* | | 2.06* | | 0.95 | | 0.92 | |
| Bamboo/wood | 2.67** | | 2.32* | | 1.22 | | 1.12 | |
| Other | 2.63 | | 1.37 | | 1.02 | | 0.91 | |
| Main material of the roof | | 6.7* | | | | 18.6*** | | |
| Concrete, tile, asbestos, zinc | 1.00 | | - | | 1.00 | | - | |
| Wood | 1.12 | | - | | 1.15 | | - | |
| Leaves, other | 1.61* | | - | | 1.23*** | | - | |
| Main material of the wall | | 19.7*** | | 15.0*** | | 21.4*** | | 15.7*** |
| Brick | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Wood | 1.32* | | 1.11 | | 1.17** | | 1.04 | |
| Bamboo, other | 1.94*** | | 1.86*** | | 1.33*** | | 1.26* | |
| House type | | 14.7*** | | | | 21.2*** | | |
| Type I | 1.00 | | - | | 1.00 | | - | |
| Type II | 1.48** | | - | | 1.04 | | - | |
| Type III | 1.46** | | - | | 1.26*** | | - | |

Source: Primary analysis of the 1994 IDHS using the Cox regression proportional hazard model.

Note : RR Relative risks
- Excluded in the multivariate model
*W* Wald test
* Significant at the five per cent level
** Significant at the one per cent level
*** Significant at the 0.1 per cent level

House type
Type I: Floor: Tile/ceramic/concrete
Wall : Brick
Roof : Concrete/tile/asbestos/zinc
Type II: Floor: Concrete/dirt/other
Wall : Brick/bamboo/other
Roof : Concrete/tile/asbestos/zinc
Type III: Floor: Concrete/dirt/other
Wall : Bamboo/other
Roof : Leaves/other

## 6.7 The effects of sanitation factors

A higher quality of sanitary facilities and improved water supply are epidemiologically associated with lower mortality. Contaminated water or food can constitute a serious health hazard for a young child. They are the major causes of diarrhoeal diseases. Table 6.12 shows that the source of drinking water and the type of toilet facility were consistently significant in both univariate and multivariate analyses. The difference in using toilet facilities were more significant in effecting

Table 6.12 The relative risk of sanitation factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Source of drinking water | | 66.8*** | | 16.4*** | | 103.7*** | | 22.9*** |
| Piped | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Pump/well | 1.80*** | | 1.40*** | | 1.65*** | | 1.27** | |
| Other | 2.19*** | | 1.52*** | | 2.17*** | | 1.48*** | |
| Type of toilet facility | | 177.7*** | | 128.2*** | | 174.6*** | | 100.4*** |
| Private with septic tank | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Private no septic tank | 1.58*** | | 1.46*** | | 1.71*** | | 1.54*** | |
| Shared/Public | 1.63*** | | 1.51*** | | 1.88*** | | 1.72*** | |
| Other | 2.37*** | | 2.12*** | | 2.45*** | | 2.10*** | |

Source: Primary analysis of the 1991 and 1994 IDHS using the Cox regression proportional hazard model.

Note : RR Relative risks

*W* Wald test

* Significant at the five per cent level

** Significant at the one per cent level

*** Significant at the 0.1 per cent level

infant mortality than the source of drinking water as shown by the coefficients of the *Wald* test.

Children who drank piped water had more chance of surviving during infancy than those who consumed from other sources. The effect of the source of drinking water in reducing infant mortality was slightly lower in 1994 than 1991. However, in the multivariate model, the effect of drinking water was less significant when the place of residence was controlled (Table 6.13). This indicates a positive association between the two indicators. In urban areas, the source of drinking water doesn't affect infant mortality significantly: the effect of the sources of drinking water is more pronounced in rural areas.

Children who were born in households which had a private toilet with a septic tank have the lowest risk of infant mortality. The most disadvantageous were children who lived in a household with pit, bush, or river as their toilet facility. The effect of a toilet facility remained significant when the place of residence variable was controlled.

Table 6.13 The relative risk of sanitation factors contributing to infant mortality according to place of residence, Indonesia, 1994 IDHS

| Variable | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Source of drinking water | | 17.6*** | | 7.19* | | 34.4*** | | 12.2** |
| Piped | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Pump/well | 1.12 | | 0.95 | | 1.86*** | | 1.52** | |
| Other | 1.84*** | | 1.37 | | 2.15*** | | 1.64*** | |
| Type of toilet facility | | 35.5*** | | 26.6*** | | 71.2*** | | 49.2*** |
| Private with septic tank | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Private no septic tank | 1.45** | | 1.38* | | 1.57*** | | 1.44** | |
| Shared/Public | 1.86*** | | 1.84*** | | 1.75*** | | 1.61*** | |
| Other | 2.16*** | | 2.00*** | | 2.10*** | | 1.88*** | |

Source: Primary analysis of the 1994 IDHS, using the Cox regression proportional hazard model.
Note : RR Relative risks
*W* Wald test
* Significant at the five per cent level
** Significant at the one per cent level
*** Significant at the 0.1 per cent level

## 6.8 The effects of prenatal care and childbirth factors

The variables related to prenatal care and childbirth include antenatal care for pregnancy, timing for first antenatal check, frequency of antenatal visits, whether the mother had tetanus injections during pregnancy, place of delivery, assistance at delivery, whether born on time or prematurely, and the size of the baby.

A woman's health behaviour is important to a child's health, particularly the extent to which she uses the available health facilities during pregnancy, childbirth, and lactation. Utilisation of prenatal care is associated with a higher birth weight, which is regarded as the most important indicator of an infant's survival chances (Eisner et al., 1979: 887). Utilisation of health services is thought to influence health behaviour through knowledge gained in contact with health personnel. For example, prenatal visits enable women to obtain health information on prevention as well as receiving specific medical attention, resulting in lower child morbidity and mortality (Shah and Abbey, 1973; Grant, 1988: 2).

Table 6.14 The relative risk of mortality associated with pregnancy care, birth assistance and baby's size, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Prenatal care | na | | na | | | 88.1$^{***}$ | | 8.4$^{*}$ |
| Doctor | | | | | 1.00 | | 1.00 | |
| Nurse/midwife | | | | | 1.73$^{***}$ | | 1.51$^{**}$ | |
| Traditional birth attendant | | | | | 2.98$^{***}$ | | 1.41 | |
| Timing of 1$^{st}$ prenatal check | | 132.1$^{***}$ | | 5.14 | | 98.3$^{***}$ | | |
| 0-3 months | 1.00 | | 1.00 | | 1.00 | | - | |
| 4-9 months | 1.32$^{**}$ | | 1.08 | | 1.49$^{***}$ | | - | |
| Never | 2.36$^{***}$ | | 1.98$^{*}$ | | 2.24$^{***}$ | | - | |
| Prenatal visits | | 143.9$^{***}$ | | 14.5$^{**}$ | | 119.7$^{***}$ | | 21.5$^{***}$ |
| 1-5 times | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| 6-10 times | 0.75$^{**}$ | | 0.92 | | 0.64$^{***}$ | | 0.76$^{**}$ | |
| > 10 times | 0.38$^{***}$ | | 0.51$^{***}$ | | 0.40$^{***}$ | | 0.55$^{***}$ | |
| Never | 1.71$^{***}$ | | 0.70 | | 1.49$^{***}$ | | 1.21 | |
| Tetanus injection during pregnancy | | 112.9$^{***}$ | | 20.7$^{***}$ | | 81.7$^{***}$ | | 13.7$^{***}$ |
| Yes | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| No | 2.05$^{***}$ | | 1.46$^{***}$ | | 1.80$^{***}$ | | 1.37$^{***}$ | |
| Place of delivery | | 50.9$^{***}$ | | | | 29.0$^{***}$ | | |
| Paramedic place | 1.00 | | - | | 1.00 | | - | |
| Home | 1.97$^{***}$ | | - | | 1.71$^{***}$ | | - | |
| Assistance at delivery | | 71.7$^{***}$ | | 12.6$^{***}$ | | 69.5$^{***}$ | | 18.0$^{***}$ |
| Professional paramedic | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Traditional Birth attendance | 1.93$^{***}$ | | 1.37$^{***}$ | | 1.85$^{***}$ | | 1.42$^{***}$ | |
| Born | | 195.0$^{***}$ | | 120.0$^{***}$ | | 262.2$^{***}$ | | 196.8$^{***}$ |
| On time/mature | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Prematurely | 4.87$^{***}$ | | 3.85$^{***}$ | | 5.42$^{***}$ | | 4.95$^{***}$ | |
| Size of the baby | | 127.1$^{***}$ | | 56.1$^{***}$ | | 91.0$^{***}$ | | 26.1$^{***}$ |
| Large | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Average | 1.33$^{***}$ | | 1.22$^{*}$ | | 1.15 | | 1.09 | |
| Small | 2.81$^{***}$ | | 2.08$^{***}$ | | 2.25$^{***}$ | | 1.60$^{***}$ | |

Source: Primary analysis of the 1991 and 1994 IDHS, using the Cox regression proportional hazard model.

Note : RR Relative risks
- \- Excluded in the multivariate model
- *W* Wald test
- * Significant at the five per cent level
- ** Significant at the one per cent level
- *** Significant at the 0.1 per cent level

In the univariate analysis, Table 6.14 shows that all of the indicators had a significant influence on the survival of an infant. In the multivariate analysis, the place of delivery factor was not included in the model in either survey, while the timing of the first prenatal check disappeared from the model in 1994. The prenatal care indicator was available only in the 1994 IDHS. Children born to mothers who went to traditional birth attendants during pregnancy had almost three times the risk of dying during infancy than those who visited a doctor. In the multivariate analysis, after other factors were controlled for, the difference was not significant. Furthermore, Table 6.15 shows that after place of residence was taken into account, the effect of prenatal care was insignificant and therefore it was excluded from the multivariate model. Prenatal care differentials that reduced the risk of dying during infancy were more pronounced in urban areas. In urban areas, mothers who visited the traditional birth attendants during pregnancy had four times the infant mortality risk than those who visited the doctor; in rural areas, it was twice the risk.

Children of mothers who had a prenatal check in the early stage (0-3 months) of their pregnancy had the best chance of survival: children born to mothers who had never had a prenatal check during their pregnancy had the least chance. The survival chance of children during infancy rose with the increased number of pregnancy checks. A tetanus injection during pregnancy remained as an important factor even though other variables were present in the multivariate model.

The survival chance was sharply lower for premature birth than 'on time' birth, an effect that is larger during the first month than during the whole of the first year of life. Although this factor is highly significant statistically as a predictor of survival, its use is limited because there are very few children who are born prematurely (Table A.6.14). Approximate birth weight is a powerful and highly significant predictor of survival through infancy: low weight babies were most at risk. Although there is a general tendency for survival chances to increase with birth weight, the most advantageous category is not those who are largest at birth.

Table 6.15 The relative risk of pregnancy, birth assistance and baby's size on infant mortality according to place of residence, Indonesia, 1994 IDHS

| Variable | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | RR | *W* | RR | *W* | RR | *W* | RR | *W* |
| Prenatal care | | 19.3$^{***}$ | | | | 42.0$^{***}$ | | |
| Doctor | 1.00 | | - | | 1.00 | | - | |
| Nurse/midwife | 1.92$^{**}$ | | - | | 1.30 | | - | |
| Traditional birth attendant | 4.19$^{***}$ | | - | | 2.03$^{***}$ | | - | |
| Timing of 1st prenatal check | | 18.3$^{***}$ | | | | 53.6$^{***}$ | | 13.0$^{**}$ |
| 0-3 months | 1.00 | | - | | 1.00 | | 1.00 | |
| 4-9 months | 1.46$^{*}$ | | - | | 1.38$^{***}$ | | 1.30$^{**}$ | |
| Never | 3.12$^{***}$ | | - | | 1.91$^{***}$ | | 1.40$^{**}$ | |
| Prenatal visits | | 36.5$^{***}$ | | 14.6$^{**}$ | | 55.4$^{***}$ | | |
| 1-5 times | 1.00 | | 1.00 | | 1.00 | | - | |
| 6-10 times | 0.44$^{***}$ | | 0.53$^{**}$ | | 0.77$^{**}$ | | - | |
| > 10 times | 0.37$^{***}$ | | 0.51$^{**}$ | | 0.50$^{**}$ | | - | |
| Never | 1.45 | | 1.17 | | 1.47$^{***}$ | | - | |
| Tetanus injection during pregnancy | | 13.9$^{***}$ | | 4.8$^{*}$ | | 49.0$^{***}$ | | 12.1$^{***}$ |
| Yes | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| No | 1.88$^{***}$ | | 1.50$^{*}$ | | 1.64$^{***}$ | | 1.35$^{***}$ | |
| Place of delivery | | 4.0$^{*}$ | | | | 4.5$^{*}$ | | |
| Paramedic place | 1.00 | | - | | 1.00 | | - | |
| Home | 1.40$^{*}$ | | - | | 1.34$^{*}$ | | - | |
| Assistance at delivery | | 20.3$^{***}$ | | 4.6$^{**}$ | | 18.0$^{***}$ | | 7.0$^{**}$ |
| Professional paramedic | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Traditional Birth attendance | 2.11$^{***}$ | | 1.70$^{**}$ | | 1.46$^{***}$ | | 1.28$^{**}$ | |
| Born | | 64.0$^{***}$ | | 59.2$^{***}$ | | 227.0$^{***}$ | | 164.3$^{***}$ |
| On time/mature | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Prematurely | 5.6$^{***}$ | | 5.51$^{***}$ | | 5.09$^{***}$ | | 5.25$^{***}$ | |
| Size of the baby | | 19.1$^{***}$ | | | | 69.2$^{***}$ | | 22.2$^{***}$ |
| Large | 1.00 | | - | | 1.00 | | 1.00 | |
| Average | 0.98 | | - | | 1.15 | | 1.13 | |
| Small | 2.27$^{***}$ | | - | | 2.19$^{***}$ | | 1.63$^{***}$ | |

Source: Primary analysis of the 1994 IDHS, using the Cox regression proportional hazard model.
Note : RR Relative risks
- Excluded in the multivariate model

*W* Wald test

* Significant at the five per cent level

** Significant at the one per cent level

*** Significant at the 0.1 per cent level

## 6.9 The effects of socio-economic and demographic factors

Table 6.16 shows the effect of socio-economic and environmental variables on infant mortality with respect to four models. Model I includes place of residence and type of house variables. Model II includes the variables in model I plus the environmental variables (source of drinking water and type of toilet). Model III

Table 6.16 The relative risk of socio-economic and environmental factors contributing to infant mortality, Indonesia, 1994 IDHS

| Variable | Model I | | Model II | | Model III | | Model IV | |
|---|---|---|---|---|---|---|---|---|
| | RR | *W* | | | RR | *W* | RR | *W* |
| Place of residence | | $55.3^{***}$ | | $13.5^{***}$ | | $11.4^{**}$ | | $10.4^{**}$ |
| Urban | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Rural | $1.55^{**}$ | | $1.26^{***}$ | | $1.26^{***}$ | | $1.25^{**}$ | |
| Type of the house | | $29.6^{***}$ | | 2.5 | | 2.3 | | 0.7 |
| Type I | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Type II | $1.15^{*}$ | | 1.02 | | 0.97 | | 0.98 | |
| Type III | $1.33^{***}$ | | 1.08 | | 0.98 | | 0.99 | |
| Source of drinking water | - | - | | $9.1^{*}$ | | $9.1^{*}$ | | 4.7 |
| Piped | | | 1.00 | | 1.00 | | 1.00 | |
| Pump/well | | | 1.19 | | $1.17^{*}$ | | 1.09 | |
| Other | | | $1.31^{**}$ | | $1.30^{*}$ | | 1.18 | |
| Type of toilet facility | - | - | | $65.5^{***}$ | | $56.5^{***}$ | | $32.6^{***}$ |
| Private with septic tank | | | 1.00 | | 1.00 | | 1.00 | |
| Private no septic tank | | | $1.42^{***}$ | | $1.39^{***}$ | | $1.25^{*}$ | |
| Shared/Public | | | $1.64^{***}$ | | $1.58^{***}$ | | $1.41^{**}$ | |
| Other | | | $1.87^{***}$ | | $1.81^{***}$ | | $1.56^{***}$ | |
| Television | - | - | - | - | | $13.4^{**}$ | | $15.1^{***}$ |
| Have TV | | | | | 1.00 | | 1.00 | |
| Doesn't have TV but watch TV | | | | | $1.21^{**}$ | | $1.16^{*}$ | |
| Doesn't have/watch TV | | | | | 1.05 | | 0.96 | |
| Ownership of stove | - | - | - | - | | 0.4 | | 2.8 |
| Yes | | | | | 1.00 | | 1.00 | |
| No | | | | | 0.96 | | 0.90 | |
| Availability of electricity | - | - | - | - | | 0.0 | | 0.2 |
| Yes | | | | | 1.00 | | 1.00 | |
| No | | | | | 1.00 | | 0.97 | |
| Education of mother | - | - | - | - | - | - | | $29.7^{***}$ |
| Complete secondary + | | | | | | | 1.00 | |
| Complete primary | | | | | | | $1.26^{*}$ | |
| No education/some | | | | | | | $1.59^{***}$ | |
| Education of father | - | - | - | - | - | - | | $12.9^{**}$ |
| Complete secondary + | | | | | | | 1.00 | |
| Complete primary | | | | | | | 1.06 | |
| No education/some | | | | | | | $1.26^{*}$ | |
| Father's occupation | - | - | - | - | - | - | | 6.6 |
| Professional, manager | | | | | | | 1.00 | |
| Clerk | | | | | | | 1.17 | |
| Sales/service | | | | | | | 1.04 | |
| Industrial worker | | | | | | | 1.05 | |
| Agriculture worker | | | | | | | 1.11 | |
| Never work | | | | | | | $1.47^{*}$ | |

Source: Primary analysis of the 1994 IDHS, using the Cox regression proportional hazard model.

Note : RR Relative risks

- Excluded in the analysis

*W* Wald test

* Significant at the five per cent level

** Significant at the one per cent level

*** Significant at the 0.1 per cent level

includes the variables in model II and the household facility variables (possession of television and stove, and the availability of electricity). Model IV includes the variables in Model III plus the other socio-economic characteristics (education of parents and father's occupation).

The place of residence and type of house had highly significant effects on infant mortality (Model I). This indicates that the type of house and the place of residence were independent of each other. Model II shows that the effect of the type of the house on infant mortality became insignificant when the source of drinking water and the type of toilet were controlled. This means that the type of house is highly related to environmental factors, especially the type of toilet facility. House type I tends to have good toilet facilities. On the other hand, house type III tends to have inadequate toilet facilities. In addition, the effect of the place of residence remained significant in Model II. This means that the place of residence and sanitation factors are independent of one another with respect to the risk of dying during infancy.

Model III shows that the effect of the place of residence and environmental factors remained significant when the household facility factors were introduced. The possession of a stove and the availability of electricity were insignificant. The effects of these variables depended largely on the place of residence. In urban areas, there is a greater availability of electricity and more households possess a stove. The results in Model IV indicate that when further controls were introduced for the other socio-economic indicators, the effect of the place of residence, toilet facilities, and the possession of a television remained significant. In urban areas, the type of toilet facility was not dependent on the education of the mother or the higher socio-economic status of the household. In Model IV, the effect of father's occupation did not affect infant mortality. A father's occupation is highly correlated to the place of residence and the mother's education.

Table 6.17 The relative risk of demographic, socio-economic and environment factors contributing to infant mortality, Indonesia, 1994 IDHS

| Variable | Model V | | Model VI | |
|---|---|---|---|---|
| | RR | W | RR | W |
| Place of residence | | 11.5*** | | 12.5*** |
| Urban | 1.00 | | 1.00 | |
| Rural | 1.23*** | | 1.25*** | |
| Type of toilet facility | | 24.4*** | | 37.2*** |
| Private with septic tank | 1.00 | | 1.00 | |
| Private no septic tank | 1.24* | | 1.27** | |
| Shared/Public | 1.37** | | 1.42*** | |
| Other | 1.47*** | | 1.58*** | |
| Television | | 18.2*** | | 14.0*** |
| Have TV | 1.00 | | 1.00 | |
| Doesn't have TV but watch TV | 1.14* | | 1.17** | |
| Doesn't have/watch TV | 0.92 | | 0.98 | |
| Education of mother | | 21.0*** | | 49.9*** |
| Complete secondary + | 1.00 | | 1.00 | |
| Complete primary | 1.20 | | 1.14 | |
| No education/some | 1.48*** | | 1.55*** | |
| Education of father | | 11.0** | - | - |
| Complete secondary + | 1.00 | | | |
| Complete primary | 1.01 | | | |
| No education/some | 1.24* | | | |
| Sex of the child | | 34.1*** | | 33.9*** |
| Male | 1.00 | | 1.00 | |
| Female | 0.79*** | | 0.79*** | |
| Birth Order | | 63.8*** | | 80.6*** |
| 1st birth | 1.00 | | 1.00 | |
| 2nd birth | 1.48*** | | 1.02 | |
| 3rd birth | 1.61*** | | 1.14 | |
| 4th birth | 1.58*** | | 1.21* | |
| 5th birth | 1.88*** | | 1.55*** | |
| 6th birth + | 2.15*** | | 2.04*** | |
| Age of mother at child birth | | 19.0*** | | 58.8*** |
| < 20 years | 1.00 | | 1.00 | |
| 20-24 years | 0.86** | | 0.78*** | |
| 25-29 years | 0.75*** | | 0.59*** | |
| 30-34 years | 0.77* | | 0.52*** | |
| 35-39 years | 0.85 | | 0.52*** | |
| > 39 years | 0.87 | | 0.52*** | |
| Preceding interval | | 204.5*** | - | - |
| First birth | a | | | |
| < 19 months | 1.00 | | | |
| 19-36 months | 0.58*** | | | |
| > 36 months | 0.38*** | | | |
| Survival of previous child | | 186.1*** | - | - |
| First birth/alive | 1.00 | | | |
| Death | 2.14*** | | | |

Source: Primary analysis of the 1994 IDHS using the Cox regression proportional hazard model.

Note : RR Relative risks
- \- Excluded in the multivariate model
- a Linear dependent covariate with the first birth order
- W Wald test
- * Significant at the five per cent level
- ** Significant at the one per cent level
- *** Significant at the 0.1 per cent level

Table 6.17 shows the effect of combining the socio-economic, environment, and demographic variables on infant mortality into two models (Model V and Model VI). Model V includes all of the variables in Model IV which significantly affected infant mortality and also controlled for selected demographic factors. Model VI included all of the variables in Model V except for three selected variables (father's education, preceding birth interval and survival of preceding child).

Model V shows that all of the variables in this model had a significant effect on infant mortality. With respect to infant mortality, the inclusion of demographic variables into the variables in Model IV strengthened the effect of place of residence, television and education of mother. However, the demographic variables weakened the influence of toilet facilities and the education of the father.

Even though both the father's and mother's education affect infant mortality, these variables have a strong relationship to each other. For example, more educated women tend to marry similarly educated men. This relationship is shown in Model VI when the father's education is excluded from Model V. The influence of a mother's education on infant mortality was more pronounced in Model VI than in Model V. Further, the effects of birth order and maternal age at first birth were more significant in Model VI when preceding birth interval and status of preceding child were excluded. This was also shown in the *Wald* test parameters.

Table 6.17 shows that in Model VI the differences between the second, third, fourth birth order and the first birth order were less significant in affecting infant mortality compared to those in Model V. On the other hand the effect of a mother's age at birth on infant mortality strengthened in Model VI.

## 6.10 Summary

Using the 1991 and 1994 IDHS, this chapter examined separately the effects of demographic, socio-economic and health care variables on infant mortality. The place of residence was also introduced into these first stage equations. The next stage using only the 1994 IDHS constructed models that employed the combined demographic and socio-economic variables.

This chapter indicates that there were changes in the strength of the effect of demographic, socio-economic and health care variables on infant mortality between 1991 and 1994. The effects of birth order, the age of the mother at first marriage and the number of marriages of mother were more pronounced in the 1994 IDHS.

The effect of place of residence differential on infant mortality was also more significant in 1994, thus the developmental disparity means that urban infants have an increasingly greater chance of survival than rural infants. However, the differential between island groups was less significant in the 1994 IDHS. This means that the development of the different island groups is relatively balanced.

Table 6.6 shows that only the mother's education had a strengthened effect on infant mortality in the 1994 IDHS, while the effect of other socio-economic variables was reduced. With respect to sanitation factors, the effect of the source of drinking water was more pronounced in the 1994 IDHS, although the effect of a toilet facility was less significant. Further, the increased use of health care facilities and their effectiveness contributed to a decline in the infant mortality rate.

After the place of residence is introduced into the model, the effects of the socio-economic and demographic variables are more pronounced in rural areas. The exception is the effect of the mother's education differential which is more important in urban areas.

The combined effect of socio-economic and demographic factors on infant mortality was constructed into six models. Model VI is chosen as the preferred model. The effect of selected variables are stronger in this model compared to other models. In Model VI, the place of residence differential supported the conclusion that rural infants have a greater chance of dying during infancy than those in urban areas. In order to reduce the disparity between urban and rural areas, balanced development is needed, particularly the development of health services, sanitation and access to education.

The effect of a toilet facility is independent of the place of residence. An infant's survival chance increases the better the toilet facility. Children who live in households with the pit, bush, or river as their toilet facility, are 58 per cent more likely to die than those who live in households with a private toilet and septic tank. The project of '*jambanisasi*' (the construction of proper latrines) through the VCHD (village community health development program), funded by WHO and UNICEF, should be intensified. The latrine is considered as an important sanitary facility. Households with well-kept latrines indicate that inhabitants realise the importance of such hygiene. Neglected latrines can cause dangerous diseases.

The interesting feature of Model VI is the change in the net effect of birth order and maternal age at first marriage when the preceding birth interval and survival status of preceding child were excluded. The empirical relationship between mother's age and infant mortality follows an L-shaped curve, rather than a U-shape. A relatively high infant mortality risk was found among young mothers, but higher infant mortality was not found among relatively old mothers. Furthermore, high birth order ($4^{th}$ and above) significantly reduced the infant's survival chance, although these birth orders are also related to older mothers.

The net effect of the mother's education is strengthened when the father's education is removed from Model V. The mother's education is a crucial factor irrespective of the place of residence. The higher the mother's education the greater the awareness of where to seek health services/medical attention. Mothers who are educated are more likely to be responsive to ideas and services, and they have more social confidence to travel outside the home community to seek services (Caldwell, 1979; Ware, 1984).

# 7

# Provincial variation in infant mortality

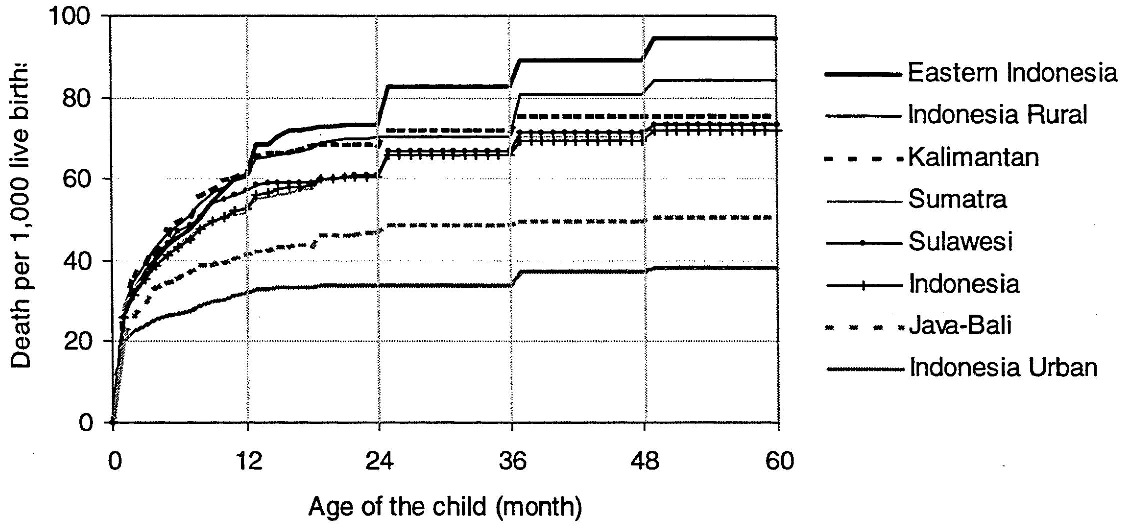
## 7.1 Introduction

The study of provincial differences of infant and child mortality is an important area because such a study helps to explain underlying factors associated with mortality. The study also provides a framework for national policies. People's lifestyle, beliefs, norms, values, socio-economic conditions, culture and activities are different according to the place where they live. Studies on child mortality in developing countries suggest that the urban and rural populations constitute two 'universes' because of the different socio-economic characteristics and the level of development associated with the place of residence. These differentials are likely to influence child survival through different mechanisms. This chapter aims to address the provincial level and variation in infant mortality controlling for socio-economic and demographic variables. The method of analysis in this chapter is the same as in Chapter Six which employed the Cox regression method in order to observe how the effects on infant mortality of different factors change when other variables are controlled. The data which are used in this chapter are derived from the 1994 IDHS. Due to the limited number of cases when grouping into provinces, the variables are combined into a smaller number of categories. The variables selection used in this chapter is based on that of the previous chapters.

## 7.2 Mortality among groups of island

Although the provision of maternal and child health care has been generally associated with better health for children, the unequal distribution of health resources and the under-utilisation of local facilities are problematic in most developing countries where resources are scare and most people are poor (Fosu, 1989: 398).

Figure 7.1 Infant and child mortality among groups of islands of Indonesia, 1989-94




Source: Demographic and Health Survey 1994

Figure 7.1 shows the proportion of children born after 1 January 1989 who have died, according to each month from birth up to five years of age, out of 1,000 births. At age one at least 61 infants in Kalimantan, Eastern Indonesia and rural Indonesia have died. This is compared to 52 in Sumatra and Indonesia as a whole, 57 in Sulawesi, 41 in Java-Bali, and 32 in urban Indonesia. By the age of five years these proportions had risen to 95 per thousand in Eastern Indonesia, 84 in rural Indonesia, 76 in Kalimantan, 74 in Sumatra, 73 in Sulawesi, 51 in Java Bali and 38 in urban Indonesia and 72 in Indonesia as a whole.

For ages after 24 months, ages at death have been edited to multiples of 12 months in the data set, creating the step-like appearance of the mortality curve. However, a certain degree of 'heaping' of ages at death especially at age 12 months is also evident in the data, with the likely result that estimates of infant mortality based on survival analysis are slightly under estimated.

Table 7.1 Distribution of treatments facilities used by people who were sick according to groups of island, 1992

| | Sumatra | | Java-Bali | | Kalimantan | | Sulawesi | | Eastern Indonesia | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban | Rural | Urban | Rural | Urban | Rural | Urban | Rural | Urban | Rural | |
| **Government** | | | | | | | | | | | |
| Hospital | 6.7 | 2.9 | 5.3 | 1.4 | 6.7 | 1.7 | 8.4 | 3.2 | 12.8 | 2.5 | 4.0 |
| Health centre | 19.3 | 23.0 | 18.7 | 24.3 | 21.8 | 22.0 | 16.9 | 24.0 | 25.3 | 35.2 | 22.0 |
| ***Total*** | ***26.0*** | ***25.9*** | ***24.0*** | ***25.7*** | ***28.5*** | ***23.7*** | ***25.3*** | ***27.2*** | ***38.1*** | ***37.7*** | ***26.0*** |
| **Private** | | | | | | | | | | | |
| Hospitals | 3.7 | 0.8 | 1.8 | 0.5 | 2.9 | 0.3 | 2.9 | 1.3 | 2.2 | 1.6 | 1.4 |
| Doctors | 17.8 | 5.6 | 19.7 | 9.4 | 17.3 | 3.4 | 18.8 | 6.7 | 16.0 | 3.7 | 12.0 |
| Clinics | 3.4 | 3.6 | 2.5 | 2.5 | 1.3 | 2.1 | 0.8 | 3.7 | 2.2 | 6.2 | 3.0 |
| Nurse/ Midwives | 9.0 | 15.4 | 7.8 | 15.9 | 5.7 | 14.7 | 8.2 | 13.8 | 7.8 | 10.1 | 11.8 |
| TBA | 4.1 | 7.9 | 1.5 | 3.3 | 1.8 | 4.1 | 5.3 | 6.1 | 3.1 | 8.2 | 4.0 |
| Other | 1.2 | 2.9 | 1.1 | 1.3 | 1.8 | 3.9 | 4.5 | 5.2 | 2.2 | 3.6 | 2.1 |
| ***Total*** | ***39.2*** | ***36.2*** | ***34.4*** | ***32.9*** | ***30.8*** | ***29.5*** | ***40.5*** | ***36.8*** | ***33.5*** | ***33.4*** | ***34.3*** |
| **Self treatment** | ***34.8*** | ***37.9*** | ***41.6*** | ***41.4*** | ***40.7*** | ***47.8*** | ***34.2*** | ***36.0*** | ***28.4*** | ***28.9*** | ***38.8*** |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

Source: MOH, 1994: Table 1.4

Table 7.1 shows the distribution of treatments facilities used by of sick people according to groups of islands. The greater proportion (38 per cent) of sick people from Eastern Indonesia visited government practitioners. Sick people from Sumatra and Sulawesi were more likely to go to private facilities rather than government facilities. On the other hand, the greater proportion of sick people from Java-Bali and Kalimantan used self treatment. Medicinal herbs or *jamu* are very common in Java-Bali and Kalimantan. One can buy *jamu* in a small shop (*warung*) without prescription.

Most people in Indonesia when they are sick tend to visit community health centres (CHC) rather than other facilities, especially those from rural areas. This is because the CHC is the closest place and the cost is inexpensive. Rural people who visit private facilities mostly go to midwives; in urban areas, people tend to visit private doctors.

## 7.3 Infant mortality according to provinces

The level of infant mortality among the provinces can be divided into three categories: low, medium and high. Low infant mortality in this study is defined as a rate of infant mortality which is 20 per cent under the national level. High mortality is defined as a rate of infant mortality 20 per cent above the national level. Medium infant mortality rate is the rate between the low and high infant mortality rates.

Table 7.2 shows the infant mortality rate according to province and place of residence, based on the 1994 IDHS. The estimates of infant mortality in this table may be affected by a small sample size, especially in urban areas. The interpretation therefore should be done cautiously. In general, the infant mortality rate in rural-Indonesia was 73 per cent higher than in urban Indonesia.

### *7.3.1 Low level of infant mortality*

Provinces with infant mortality rates of 50 per thousand births and below were categorised as low infant mortality. It is not surprising that Jakarta and Yogyakarta were categorised in the low infant mortality group. These provinces had the lowest infant mortality rates in Indonesia in the 1980 (Table 4.3). The Special Capital Region of Jakarta (*Daerah Khusus Ibukota* or DKI Jakarta) is the smallest province in Indonesia and is an exceptional region: it is an urban region, and the seat of government. Jakarta has the highest per capita income and consumption. It also has the highest proportionate concentration of the highly educated and the lowest proportion of the work force in the informal sector. Infrastructure and facilities are abundant in Jakarta, particularly those related to health care facilities. All of the facilities can easily be reached by the people.

According to the 1980 Census, Yogyakarta had the lowest infant mortality rate and the highest life expectancy of any province in Indonesia (Sigit and Suparman, 1986: 15). In terms of poverty, Yogyakarta had a slightly higher percentage than the national average (Islam and Khan, 1986). Further, a World Bank study, based on the 1980 *Susenas* indicated that Yogyakarta's rural population had the highest proportion of people in poverty anywhere in Indonesia (National Urban Development Strategic [NUDS], 1985). An important aspect of the employment diversification process regards the role of women in economic activities. Yogyakarta had the highest female participation rate in the country (59.3 per cent)(Booth and Damanik, 1989: 283-305). Furthermore, health facilities in Yogyakarta were above the national average. The ratios of community health centres, hospitals, doctors and hospital beds per million people were slightly below Jakarta. These factors contributed to the low level of infant mortality in Yogyakarta.

The other three provinces which had low infant mortality were Lampung, Central Kalimantan and East Timor. These results were surprising, particularly in Central Kalimantan which had an infant mortality rate of 20 per thousand births: below the Jakarta rate. These results are suspect probably due to non-sampling error because Central Kalimantan is one of the most isolated province in Kalimantan and one of the most isolated in Indonesia. It is one of the newest provinces having only been created in 1957. Eighty per cent of the land area is still covered by forest and it has the lowest population density of any province in Indonesia except Irian Jaya. The province's remote location has resulted in its neglect by scholars. Reflecting its low population density, Central Kalimantan has the lowest ratio of asphalt road to land area of any province apart from Irian Jaya; rivers are often the only mode of transport. The condition of the roads is very poor. Of the total of 4,500 km, only 12 per cent are asphalt, and none are 'class I'. These conditions mean that the enumerators tend to choose areas with the easiest access, although this is less likely in the IDHS survey, because the interviewers are in a team (discussed in Chapter Two). Two-thirds of the population in this province is Dayak. Central Kalimantan is indeed the heartland of

Dayak culture. Dayak mothers are uncomfortable mentioning the death of their children. Therefore, the results tend to be under-estimated.

East Timor is the newest province in Indonesia. This province has a limited natural and human resources base. The civil war severely damaged East Timor's economy, especially its agricultural output. Moreover, in spite of significant economic growth, there is still some lack of confidence in an understanding of a new system. In addition there may be some bitter feeling and apathy among the population resulting from the civil war, including the widespread loss of life and economic dislocation. There is still civil unrest especially in remote areas. This means that remote areas are excluded from chosen samples and the infant mortality rate is therefore under-estimated. Based on the 1995 Intercensal Survey, 48 per cent of East Timorese were still illiterate (Table A.7.1), but the ratio of health facilities to population was above the national average (Table A.7.2). These facilities are concentrated in urban areas.

Table 4.3 shows that since 1980, the infant mortality rate in Lampung has considerably declined. In the 1990, Lampung's infant mortality has been slightly below the national average, although its rate was not the lowest in Sumatra. Whether the infant mortality of Lampung is reliable or not is questionable because Lampung is one of the poorest provinces in Indonesia. This province acts as an outlet in alleviating Java's 'population problem'. The transmigration program has resulted in many of Java's serious socio-economic problems being transferred to a new environment. Lampung province has been the most popular place for Javanese transmigration since the colonial era. This has made Lampung more like Java in socio-economic and cultural characteristics (Hugo et al., 1987). Lampung has the highest population growth of any province in Indonesia. In 1991, the ratio of health facilities per million people was the lowest among Indonesian provinces (Table A.7.2).

### *7.3.2 Medium level of infant mortality*

Medium infant mortality is the mortality rate that lies between 50 to 75 deaths per thousand births. There are 18 provinces included in this category. All provinces in Sumatra except Lampung fall into this category. The general condition of Sumatra is the same. Some provinces have oil and gas resources such as Aceh and Riau. Nevertheless, due to the fact that all of the regions' income is managed by the central government, regional development is not dependent on the availability of natural resources. Even though Riau is one of the richest provinces in Sumatra and Indonesia, the ratio of health facilities, especially doctors and hospital beds per million people, is far below the national average Table A.7.2). Table 7.1 shows that the infant mortality rate in Riau is the highest among provinces in Sumatra. Since 1971, the levels of infant mortality across Sumatra provinces have been relatively similar, although the rates have decreased steadily in all provinces up to 1990 (Table 4.3).

In Java-Bali there are three provinces that are included in the medium infant mortality group, Central Java, East Java and Bali. Hill (1987) refers to East Java as 'the most industrialised province' in Indonesia as it has the highest percentage (27 per cent) of 'value added' in the nation's manufacturing sector. The population pressure and limited supplies of land in Central Java, East Java and Bali led to accelerated out-migration. The population pressure is also related to agricultural intensification and diversification, and increased movement into non-agricultural occupations in both industry and services. The female participation rates in these three provinces were among the highest in the country. Even though such work is often irregular and almost always characterised by low productivity and low pay, it gives families at the bottom end of the income scale some extra money to support them against poverty.

Bali is probably one of the best known Indonesian provinces to the outside world as it is a well known tourist destination. Bali is one of the smallest provinces in Indonesia. The land is very fertile because Bali has a central mountain range of volcanic origin; with six mountains peaks over 2,000 m high. Many rivers and streams flow down irrigating rice fields. It has a predominantly Hindu population. Bali's economic growth has increased above the Indonesian average. Water management in Bali is more advanced than almost anywhere else in Indonesia (Bendesa and Sukarsa, 1980). The traditional irrigation system has existed in Bali for over 1,000 years. *Subak*[10] regulate all of the activities, such as the allocation of the irrigation water, maintenance of dams, channel, order of planting and harvesting, and choice of crops.

Bali has recorded impressive growth since the early 1970s. A major contribution to this growth has come from higher productivity in the agricultural sector, particularly in the rice sector. Tourism has also made an important contribution. In 1991, the ratio of the health facilities to population was above the national average.

In Kalimantan, only the East Kalimantan province was categorised in the medium infant mortality group. East Kalimantan has the largest area in Kalimantan, much larger than the island of Java. The population of this province is mainly indigenous people, the *Dayak*. The population density is very low, only more populated than Central Kalimantan and Irian Jaya. East Kalimantan is one of Indonesia's richest provinces with extensive petroleum, natural gas (LNG) and timber resources. Daroesman described economic growth in East Kalimantan in the late 1970s as extreme. However, there remain sectoral disparities in terms of development within provinces. On the one hand, there are modern oil, gas and timber industries. On the other hand there are traditional labour techniques used in agriculture, petty trade, and other activities. It can be noted that the disparity between urban and rural infant mortality in this province is very high: the ratio was 2.29 (Table 7.1). The proportion of health facilities to population in East Kalimantan province is among the highest in Indonesia (Table A.7.2).

---

[10] Subak is the 'co-operation' of the community, which consists of all of the *sawah* (field) holders obtaining water from the same sources.

North Sulawesi, South Sulawesi and Southeast Sulawesi are included in the medium infant mortality group. North Sulawesi is socially well developed: high levels of education, good health and reasonable nutritional intake. These factors have contributed to the relatively low infant mortality rate, even though the per capita GDP is below the national average. Health centres are relatively extensive, and the number of doctors and hospital beds per population are greater than the national average (Table A.7.2).

South Sulawesi is the most populous and economically developed province outside Java. Based on the 1995 Intercensal Survey, about 70 per cent of the population reside in rural areas (CBS, 1996c). There are two large ethnic groups, Buginese and Makassarese. This province has a strong agricultural base, many fisheries, and a low level of manufacturing. About 70-90 per cent of the crops produced are shipped to other provinces. The most common industrial crops are coconut, coffee, clove, pepper and nutmeg.

Education expenditure in the province has increased rapidly since the mid 1970s and combined with a significant expansion in private sector facilities, achievements have been impressive. Nevertheless, South Sulawesi still lags behind North Sulawesi, both in enrolment ratios and in community attitudes toward education, particularly for females.

Health facilities are relatively similar to the national average (Table A.7.2). In 1992, there were about 92 doctors and 689 hospital beds per one million people. However, few can afford such facilities and they are highly concentrated in the capital, Ujung Pandang.

Southeast Sulawesi is one of the poor provinces in Indonesia; its GDP is below the national average. Based on the 1995 Intercensal Survey, 57 per cent of the population are engaged in agricultural sectors compared to the national average of 44 per cent (CBS, 1996c). It is estimated that only one third of the total farmland is irrigated. Cassava is the most important crop. Transmigration from Java and Bali introduced wet-rice cultivation to the indigenous peoples. This induced government investment in infrastructure, including irrigation facilities. Nevertheless, Southeast Sulawesi remains a rice-deficit region. Fisheries also have a considerable potential in this province. The illiteracy rate in 1995 was higher than national average (Table A.7.1). The ratios of doctors and hospital beds were very low, less than the national average (Table A.7.2).

Among the Eastern Indonesia provinces, East Nusa Tenggara, Maluku and Irian Jaya were categorised in the medium level infant mortality group. East Nusa Tenggara is similar to West Nusa Tenggara: poor, isolated and one of the less developed provinces in Indonesia. The dry season in East Nusa Tenggara may last seven months: it has the lowest recorded rainfall of any Indonesian province. The water supply problem is not confined to water for agricultural purposes: during the dry season many rural residents in this province have to carry domestic water several kilometers, while in urban areas there are frequent interruptions to town water supplies. Based on the 1995 Intercensal Survey, the illiteracy rate was above the national average (Table A.7.1). The ratio of community health services and hospitals per one million people was above the national average, but the ratios of doctors and hospital beds were below the national average (Table A.7.2). The GDP per capita is one of the lowest in Indonesia, only slightly higher than East Timor.

Maluku is known as the 'Spice Island'. Fisheries have played an important role in developing Maluku's economy. It is estimated that 75 per cent of the province is forested. The other important natural resources that have been recently discovered include nickel, manganese, sulphur, gold and copper.

Maluku had 2.06 million inhabitants in 1995, accounting for 1.06 per cent of Indonesia's population and ranking it 19 out of the 27 provinces. The illiteracy rate is 6 per cent one of the lowest in Indonesia (Table A.7.1). The ratio of community health centres, hospitals, and hospital beds per million people is higher than the national average (Table A.7.2).

Table 7.2 Infant mortality according to place of residence and province, Indonesia 1984-1994, 1994 IDHS

| Province | Total | | Urban | | Rural | | Ratio Rural/Urban |
|---|---|---|---|---|---|---|---|
| | IMR | N | IMR | N | IMR | N | |
| **Sumatra** | **60** | **(11913)** | **37** | **(2490)** | **66** | **(9423)** | **1.78** |
| Aceh | 60 | (1677) | 23 | (264) | 66 | (1413) | 2.87 |
| North Sumatra | 63 | (2142) | 41 | (563) | 71 | (1579) | 1.78 |
| West Sumatra | 65 | (1263) | 42 | (193) | 69 | (1070) | 1.73 |
| Riau | 71 | (1561) | 53 | (482) | 78 | (1079) | 1.47 |
| Jambi | 60 | (1220) | 20 | (249) | 71 | (971) | 3.55 |
| South Sumatra | 58 | (1435) | 34 | (361) | 64 | (1074) | 1.88 |
| Bengkulu | 69 | (1212) | 47 | (217) | 74 | (995) | 1.57 |
| Lampung | 37 | (1403) | 19 | (161) | 40 | (1242) | 2.11 |
| **Java-Bali** | **56** | **(9328)** | **40** | **(4142)** | **70** | **(5186)** | **1.75** |
| Jakarta | 30 | (1892) | 30 | (1892) | na | na | - |
| West Java | 88 | (2130) | 43 | (667) | 11 | (1463) | 2.58 |
| Central Java | 53 | (1741) | 55 | (459) | 1 | (1282) | 0.95 |
| Yogyakarta | 32 | (1003) | 17 | (418) | 52 | (585) | 2.47 |
| East Java | 64 | (1332) | 43 | (370) | 42 | (962) | 1.65 |
| Bali | 53 | (1230) | 58 | (336) | 71 | (894) | 0.84 |
| | | | | | 49 | | |
| **Kalimantan** | **71** | **(4923)** | **50** | **(1048)** | **77** | **(3875)** | **1.54** |
| West Kalimantan | 101 | (1640) | 43 | (281) | 110 | (1359) | 2.56 |
| Central Kalimantan | 20 | (1037) | 20 | (156) | 21 | (881) | 1.05 |
| South Kalimantan | 82 | (1154) | 89 | (286) | 80 | (868) | 0.90 |
| East Kalimantan | 63 | (1092) | 35 | (325) | 80 | (767) | 2.29 |
| **Sulawesi** | **69** | **(4990)** | **51** | **(992)** | **73** | **(3998)** | **1.43** |
| North Sulawesi | 63 | (978) | 54 | (228) | 64 | (750) | 1.19 |
| Central Sulawesi | 84 | (1136) | 58 | (179) | 88 | (957) | 1.52 |
| South Sulawesi | 61 | (1716) | 48 | (423) | 69 | (1293) | 1.44 |
| Southeast Sulawesi | 69 | (1160) | 44 | (162) | 72 | (998) | 1.64 |
| **Eastern Indonesia** | **68** | **(7474)** | **48** | **(1058)** | **72** | **(6416)** | **1.50** |
| West Nusa Tenggara | 102 | (1532) | 97 | (254) | 106 | (1278) | 1.09 |
| East Nusa Tenggara | 69 | (1388) | 51 | (141) | 72 | (1247) | 1.41 |
| East Timor | 48 | (2005) | 35 | (178) | 49 | (1827) | 1.40 |
| Maluku | 66 | (1347) | 15 | (207) | 74 | (1140) | 4.93 |
| Irian Jaya | 60 | (1202) | 33 | (278) | 67 | (924) | 2.03 |
| **Indonesia** | **63** | **(38628)** | **41** | **(9730)** | **71** | **(28898)** | **1.73** |

Notes : Figure in brackets represents the number of cases at risk

Source: Primary analysis of the 1994 IDHS, using life table survival analysis

Irian Jaya is the most isolated province in Indonesia. Linkages between urban centres and rural communities depend on regular air and sea transport. The majority of Irianese depend on subsistence-oriented agriculture, livestock, fishing, and hunting. Poor modes of communication and a low level of education in Irian Jaya were characteristics shared by other areas in eastern Indonesia. The illeteracy rate was more than double the national average. The ratios of community health centres, hospitals, and hospital beds per million people were above the national average, although the facilities are concentrated in urban areas. At the end of 1997, there was a famine due to the long dry season; an estimated 653 people died (Kompas Online, 21 December 1997).

### *7.3.3 High level of infant mortality*

A high level of infant mortality in this study is defined as an infant mortality rate above 75 per thousand births in the 1984-94 period. There are five provinces in Indonesia categorised as having a high level of infant mortality: West Java, West Kalimantan, South Kalimantan, Central Sulawesi and West Nusa Tenggara. The annual decline of infant mortality in these provinces is lower compared to other provinces in Indonesia (Table 4.3).

Daroesman (1972) and Hardjono and Hill (1989) argue that West Java has been considered the most prosperous of the provinces of Java. The land in this province is fertile. Its vast paddy fields produce more rice than any other province.

West Java is still widely believed to be the most prosperous of the three large provinces of Java. The province has retained its reputation as the country's most prestigious in terms of education and research centres, possessing two of Indonesia's most prestigious tertiary institutions, Institute Pertanian Bogor (IPB) and Institute Teknologi Bandung (ITB). It is adjacent to the country's administrative and financial capital. However, West Java also faces a number of socio-economic problems. The population growth is faster than other provinces because there is substantial 'spillover' from Jakarta. There are sharp socio-economic differences within the province. It contains some of the poorest regions in Java.

The southern part of this province is less populated, and is a neglected region. The northern part has benefited due to the rapid increase in transportation modes to Sumatra. Despite similar population densities, West Java has less administrative units than the other provinces in Java, so that villages in the province cover larger territorial units and hence have a larger population than those in Central and East Java. The implication is obvious for government services that are provided on a subdistrict basis (such as community health centres) or an annual village basis (such as the annual village subsidy).

This highlights the relatively limited number of community health centres and mother-child-care facilities in this province. The 1995 Intercensal Survey found that in rural areas, 21 per cent of women were married for the first time at age less than 14 years: in urban areas the figure is 11 per cent (CBS, 1996c). This factor has obvious implications for family planning and contributes to the high infant mortality rate.

West Kalimantan is one of the least densely populated provinces in Indonesia and is characterised by uneven spatial development. West Kalimantan's capital, Pontianak, has the province's only *kotamadya*. Pontianak is probably one of the most 'Chinese' cities in Indonesia. One of the *kabupaten* capital cities, Putussibau, is not yet connected to Pontianak by road. It is reached instead by the *Sungai Kapuas* (Kapuas River). The river is navigable for almost 1,000 kilometers when rains are sufficient to provide adequate river height. A trip from Pontianak to Putussibau by riverboat may take as long as two weeks. The distribution of roads and road transport within the province is uneven. The province's road network is concentrated in the city and Pontianak's surrounding *kabupatens*. Therefore, the difference in infant mortality between urban and rural areas is very high. Ninety three per cent of households in urban areas used electricity in 1995 compared to 36 per cent for rural households. In rural areas, most households (46 per cent) use the river as their source of drinking water: in urban areas, the figure is only two per cent. The rural infant mortality rate contributed to the high mortality level in West Kalimantan (Table 7.1).

Agriculture is very important in South Kalimantan. The uplands make possible the siting of dams for gravity irrigation and rice intensification through double cropping. The western part of this province is the most fertile area for rice production. The large total increase in cultivation area and production from 1970 to the present day has given South Kalimantan a considerable surplus in rice, such that it can supply its neighbours with rice. Forestry is by far the largest agricultural sub-sector; in 1995, it contributed up to 57 per cent of total agricultural production (CBS, 1996d). Although basic health indicators have improved in South Kalimantan, the current situation is still not good. The ratio of doctors to population is below the national average. Poor environmental sanitation and inadequate nutrition provide much of the explanation for the high infant mortality. The Banjarnese tradition of living along streams and using water, often heavily polluted with coliform bacteria, for all purposes including cooking, carries an obvious health risk.

Central Sulawesi is a remote and isolated province possessing a weak infrastructure. The population depends on sea communications as land transportation is poorly developed. The development in Central Sulawesi has been geographically uneven, with concentration around the towns of Palu and Donggala; other areas, particularly in the northern and eastern parts of the province are more isolated and less developed. Central Sulawesi consistently has had one of the lowest per capita GDPs of any province (Table A.7.3).

West Nusa Tenggara is a the poo, relatively isolated, and under developed province so the mortality rate might be linked to, the impact of physical isolation, inadequate infrastructure and limited natural resources. Low economic activity is a major handicap to further development. There is also a lack of water storage for irrigation, steep terrain, and limited scope for agriculture, except in central Lombok. Agriculture is severely restricted by the long dry period.

The population distribution contributes a social dimension to the isolation of many communities in West Nusa Tenggara. The distribution of the population is an obstacle for development. This province is also a resource of transmigrants to other provinces (mainly Sulawesi and Kalimantan). "As may be inferred from the infant mortality figure, the basic health needs of the population of West Nusa Tenggara are far from being satisfied: the population suffers from more serious health problems than most other provinces of Indonesia" (Corner, 1989: 179-206). The incident of hepatitis B is high. Cholera and other gastroenteritis infections associated with inadequate and polluted domestic water sources cause epidemics. There is also a high incidence of malnutrition which causes a high level of sensitivity of infection. Health is also indirectly affected by poor nutrition caused by dietary intake that is limited in both quantity and quality. Provision of adequate supplies of clean water remains one of the major needs for both rural and urban areas.

Djelantik et al. (1995) found that the main cause of infant death in Lombok island was infection. This is obviously related to the overall poor socio-economic status, the culture of the community, and the inadequate service provided by the health care provider.

### 7.4 Infant mortality differential by place of residence

The differentials of infant mortality between urban and rural areas show that there are disparities in term of socio-economic status and regional development, especially in the availability of health facilities between urban and rural areas.

Table 7.2 shows that Central Java, Bali and South Kalimantan are the only provinces that had lower infant mortality in rural areas than in corresponding urban areas. Among the provinces, Maluku had the highest disparity between urban and rural areas (the ratio 4.93). This province had the lowest infant mortality rate in urban areas, 15 per 1,000 life births. This figure seems unreliable; it may be due to the small number of cases or non-sampling error.

Among provinces in Kalimantan, West Kalimantan had the highest disparity in the infant mortality rate between urban and rural areas (ratio = 2.63). The lowest infant mortality rate among urban areas in Kalimantan provinces was in Central Kalimantan (20 per thousand births). South Kalimantan had the highest infant mortality rate among urban areas.

There is a very limited range of infant mortality rates between the urban and rural areas in Sulawesi. The lowest infant mortality rate in urban areas is found in Southeast Sulawesi (44 per thousand births), while the highest is in Central Sulawesi (60 per thousand births). Furthermore, the lowest infant mortality rate in rural areas is found in North and South Sulawesi (65 per thousand births), and the highest in Central Sulawesi (88 per thousand births).

In the big and isolated provinces (such as provinces in Kalimantan, Sulawesi and Eastern Indonesia), the development of many economic sectors is usually concentrated in the city. Those who live around the city are the most advantageous. They can easily gain access to good sanitation, health facilities, transportation, communication, and good education. Those who live in rural and remote areas cannot get all of these facilities. These differences contribute to the disparity between urban and rural areas in infant mortality.

## 7.5 Relative risk of infant mortality among provinces

Table 7.3 shows the provincial differential of the relative risk of infant mortality with Jakarta province as a reference category. Jakarta is the capital city of Indonesia and it has the country's best health facilities. These facilities enable the Jakarta province to have one of the lowest infant mortality rates in Indonesia.

Most children who live outside Jakarta have a greater risk of dying during infancy. The exception is for children who live in Central Kalimantan. They have a lower risk of dying during infancy compared to those of Jakarta, although the difference is insignificant. Central Kalimantan has the lowest recorded infant mortality

Table 7.3 The relative risk of infant mortality according to province, Indonesia 1984-94, 1994 IDHS

| Province | N | Relative risks | IMR Per 1,000 births |
|---|---|---|---|
| Aceh | 1677 | 1.71*** | 60 |
| North Sumatra | 2142 | 2.11*** | 63 |
| West Sumatra | 1263 | 1.96*** | 65 |
| Riau | 1561 | 2.06*** | 71 |
| Jambi | 1220 | 1.86*** | 60 |
| South Sumatra | 1435 | 1.88*** | 58 |
| Bengkulu | 1212 | 2.32*** | 69 |
| Lampung | 1403 | 1.17 | 37 |
| **Jakarta (Reference category)** | **1892** | **1.00** | **30** |
| West Java | 2130 | 2.63*** | 88 |
| Central Java | 1741 | 1.62*** | 53 |
| Yogyakarta | 1003 | 0.80 | 32 |
| East Java | 1332 | 1.72*** | 64 |
| Bali | 1230 | 1.26 | 53 |
| West Kalimantan | 1640 | 2.98*** | 101 |
| Central Kalimantan | 1037 | 0.83 | 20 |
| South Kalimantan | 1154 | 2.34*** | 83 |
| East Kalimantan | 1092 | 1.84*** | 63 |
| North Sulawesi | 978 | 1.72*** | 63 |
| Central Sulawesi | 1136 | 2.55*** | 84 |
| South Sulawesi | 1716 | 1.84*** | 61 |
| Southeast Sulawesi | 1160 | 1.99*** | 69 |
| West Nusa Tenggara | 1532 | 3.20*** | 102 |
| East Nusa Tenggara | 1388 | 2.24*** | 69 |
| East Timor | 2005 | 1.86*** | 48 |
| Maluku | 1347 | 1.88*** | 66 |
| Irian Jaya | 1202 | 1.90*** | 60 |

Source: Primary analysis of the 1994 IDHS, using life table survival analysis
Note: *** Significant at the 0.1 per cent level

in Indonesia both urban and rural areas, 20 and 21 per thousand births (Table 7.2). This is very surprising as it is a remote province. It may be due to sampling or non-sampling errors.

Children from West Nusa Tenggara, West Kalimantan and West Java provinces had more than three times the risk of dying during infancy than children from the Jakarta province. Children who live in West Nusa Tenggara are reported to be 3.6 times more likely to die during infancy than those who live in Jakarta. In addition, children who were born in West Java (neighbouring Jakarta) are three times more likely to die during infancy than children born in Jakarta. Furthermore, the infant mortality rate differential between Yogyakarta, Lampung, Bali and Central Kalimantan and Jakarta is insignificant.

There are many factors affecting the infant mortality differential. The cultural differences between provinces are one of the reasons why the infant mortality rate varies provincially. As described in Chapter Four, Hull et al. (1995), found that mothers in Lombok (West Nusa Tenggara) were quite 'open and uninhibited' about reporting the death of their babies. Mothers from other ethnic groups might feel uncomfortable reporting the death of their babies even though the interviewers probe to get information. Therefore, further qualitative research is needed across the provinces of Indonesia. Health facilities which can easily be reached by people are also an important factor affecting infant mortality differentials among provinces.

## 7.6 Socio-economic and demographic differential in infant mortality among provinces

The analysis in this section only uses selected socio-economic and demographic variables. The selection of the variable is based on the strength of the variable's effect on infant mortality as mentioned in Chapter Six. The variables can be grouped into only two categories due to the small number of cases in each province. The selection of the category as reference category is also based on the analysis in Chapter Five and Six.

### *7.6.1 Demographic determinants*

There are only three variables included in this analysis: sex of the child, birth order and age of mother at childbirth. The differences in the sex of the child only appear significant in some provinces (Table 7.4). Male babies have a higher risk of dying during infancy in all provinces, except in Lampung, East Timor and Irian Jaya. In Lampung, female infants have a 35 per cent higher risk of dying during infancy than males, but the result was not statistically significant, due to small sample sizes.

The greatest difference in the risk of dying during infancy between male and female was found in Central Kalimantan. In this province, the risk of female infant death was less than one-third that of males, and the result was significant at one per cent. However, to know whether there is any sex preference between males and females needs further qualitative research in each province.

In terms of birth order, this analysis only compares the risk of dying of children of birth order 1 to 3 (low birth order) and children birth of order 4 and above (high birth order). Birth order 1 to 3 is used as a reference category. Table 7.4 shows that a high birth order infant experienced a higher risk of dying during infancy in all provinces, except in South Sumatra, Yogyakarta, West Nusa Tenggara and East Nusa Tenggara, all of these results being insignificant. In East Kalimantan, the risk of dying for high birth order infants was more than double that of low birth order infants. In Bali and Irian Jaya, low birth order infants had almost twice the risk of dying than high order infants.

The age of the mother at child birth was categorised into two groups, 'low risk' (age 20-34) and 'high risk' (age less than 20 years and greater than 35 years). Table 7.4 shows that children born to mothers of 'low risk' ages were more likely to survive during infancy than those born to mothers with 'high risk' ages in all provinces, except Lampung and Yogyakarta. In Bali and Jambi, the age of the mother at childbirth is a crucial factor affecting infant mortality. Children born to 'high risk' aged mothers are around two times more likely to die during infancy than those born to 'low risk' aged mothers. In Eastern Indonesian provinces, the age of mother at child birth is also an important factors contributing to infant mortality, except in East Nusa Tenggara. On the other hand, this factor seems less important in the provinces of Kalimantan and Sulawesi.

### *7.6.2 Socio-economic determinants*

The selected socio-economic variables used in this analysis were place of residence, mother's and father's education, father's occupation, possession of a

Table 7.4 The relative risk of selected demographic and socio-economic variables on infant mortality according to province, Indonesia, 1994 IDHS

| Province | Sex of the child | Birth order | Age of mother | Place of residence | Mother education | Father education |
|---|---|---|---|---|---|---|
| Reference category[a)] → | Male | 1 to 3 | 20-34 | Urban | Educated | Educated |
| Comparison category → | Female | 4+ | other | Rural | Uneducated | Uneducated |
| Sumatra | | | | | | |
| Aceh | 0.69* | 1.32 | 1.19 | 1.65 | 1.86*** | 1.61** |
| North Sumatra | 0.83 | 1.47** | 1.38* | 1.78** | 1.55** | 1.35* |
| West Sumatra | 0.70* | 1.58** | 1.33 | 2.32* | 1.94*** | 1.56** |
| Riau | 0.94 | 1.14 | 1.16 | 1.54* | 1.22 | 1.23 |
| Jambi | 0.78 | 1.49* | 1.95*** | 4.07*** | 1.48* | 1.70** |
| South Sumatra | 0.80 | 0.95 | 1.02 | 2.25** | 1.85*** | 2.08*** |
| Bengkulu | 0.79 | 1.46* | 1.25 | 1.31 | 1.41* | 1.35 |
| Lampung | 1.35 | 1.25 | 0.73 | 1.50 | 1.55* | 2.12*** |
| Java-Bali | | | | | | |
| Jakarta | 0.94 | 1.01 | 1.11 | na | 2.83*** | 2.34*** |
| West Java | 0.86 | 1.17 | 1.18 | 2.14*** | 2.02*** | 2.05*** |
| Central Java | 0.76 | 1.37 | 1.32 | 1.05 | 1.48* | 1.57** |
| Yogyakarta | 0.45** | 0.94 | 0.98 | 1.81* | 1.73* | 1.46 |
| East Java | 0.78 | 1.74** | 1.67** | 1.31 | 1.54* | 1.70** |
| Bali | 0.72 | 1.98*** | 2.03*** | 1.16 | 2.87*** | 1.46* |
| Kalimantan | | | | | | |
| West Kalimantan | 0.83 | 1.18 | 1.07 | 2.59*** | 2.64*** | 2.06*** |
| Central Kalimantan | 0.27** | 1.76 | 1.57 | 0.73 | 1.12 | 2.09* |
| South Kalimantan | 0.69* | 1.25 | 1.29 | 0.73 | 1.64** | 1.52** |
| East Kalimantan | 0.93 | 2.23*** | 1.30 | 2.55*** | 2.55*** | 2.08*** |
| Sulawesi | | | | | | |
| North Sulawesi | 0.91 | 1.67* | 1.13 | 1.18 | 2.07*** | 2.25*** |
| Central Sulawesi | 0.80 | 1.40* | 1.24 | 1.30 | 1.59** | 1.34 |
| South Sulawesi | 0.83 | 1.14 | 1.18 | 1.47 | 1.77*** | 1.54** |
| Southeast Sulawesi | 0.94 | 1.08 | 1.08 | 2.04* | 1.24 | 1.53* |
| Eastern Indonesia | | | | | | |
| West Nusa Tenggara | 0.76* | 0.91 | 1.41** | 1.26 | 1.31* | 1.15 |
| East Nusa Tenggara | 0.66* | 0.97 | 1.15 | 1.34 | 1.77** | 1.05 |
| East Timor | 1.03 | 1.10 | 1.41* | 1.37 | 1.93* | 1.39 |
| Maluku | 0.77 | 1.15 | 1.54* | 2.43* | 1.90*** | 2.12*** |
| Irian Jaya | 1.12 | 1.96*** | 1.64** | 2.41** | 1.46 | 0.61* |

Source: 1994 IDHS data set, using the Cox regression proportional hazard model.
Notes: [a)] The coefficient of reference category is equal 1
* Significant at the five per cent level.
** Significant at the one per cent level.
*** Significant at the 0.1 per cent level.

television, possession of a stove, type of house, source of drinking water, and possession of a toilet.

In Jambi, the urban-rural disparity of infant mortality is the largest in Indonesia. Children born in rural Jambi are four times more likely to die during infancy than those born in urban Jambi. Other provinces which have more than double the risk of dying between rural and urban areas are West Sumatra, South Sumatra, West Java, West Kalimantan, East Kalimantan, South Kalimantan, East Sulawesi, Maluku and Irian Jaya. This suggests that the development of urban and rural areas in these provinces is unbalanced. This is likely to be especially true of health facilities, the provision of clean drinking water, good sanitation, and accessible education.

It may be inferred with reasonable confidence that the parent's educational backgrounds are important for an infant's survival chances. This is the case in nearly all provinces. It has already been discussed in the previous chapter that the parent's education can be used as a proxy of household income. Highly educated parents are more likely to have a better job and consequently they will have a better income.

Father's occupations can be categorised as 'non-agricultural' or 'agricultural'. The non-agricultural sector is used as a reference category. Table 7.5 shows that children whose fathers work in the agricultural sector had a greater risk of dying during infancy than those children whose fathers work in the non-agricultural sector. Fathers who work in agricultural sectors mostly live in rural areas. The income disparity between these categories is also very high. Therefore, children whose fathers work in the agricultural sector are more likely to live in low socio-economic households, and areas which lack health facilities. In East Kalimantan, children of fathers working in the agricultural sector are 2.4 times more likely to die during infancy than those children whose fathers work in the non-agricultural sector. In this province, fathers who work in the non-agricultural sector are more likely to work in urban areas for an oil or gas company that usually provides free health care as well as a good salary .

The possession of a television and a stove can be used as a wealth proxy of the household. The households that possess a television and a stove are used as a reference category. Children in households which do not have a television and stove are more likely to die during infancy in all provinces, except Central Sulawesi. In some

Table 7.5 The relative risk of selected socio-economic and sanitation variables on infant mortality according to province, Indonesia, 1994 IDHS

| Province | Father Occupation | Possession of TV | Possession of stove | Type of House | Source of drinking water | Possession of toilet |
|---|---|---|---|---|---|---|
| Reference category[a] → | Non agric. | Yes | Yes | Type 1 | Pipe, pump | Yes |
| Comparison category → | Agric. | No | No | Type 2,3 | Other | No |
| Sumatra | | | | | | |
| Aceh | 1.98*** | 1.24 | 1.56* | 1.18 | 1.48* | 1.21 |
| North Sumatra | 1.78*** | 1.71*** | 2.04*** | 1.96*** | 1.98*** | 1.72*** |
| West Sumatra | 1.67** | 1.64** | 1.45* | 1.24 | 1.47* | 2.65*** |
| Riau | 1.34 | 1.18 | 1.19 | 1.21 | 1.16 | 1.15 |
| Jambi | 2.27*** | 2.33*** | 2.96*** | 2.05*** | 1.24 | 1.96*** |
| South Sumatra | 1.43* | 1.39 | 2.61*** | 1.94*** | 1.29 | 2.02*** |
| Bengkulu | 1.33 | 1.37 | 1.09 | 1.06 | 0.82 | 1.35 |
| Lampung | 1.35 | 1.47 | 1.50 | 1.48 | 0.91 | 1.36 |
| Java-Bali | | | | | | |
| Jakarta | 1.03 | 1.90** | 1.82 | 0.96 | 2.24*** | 2.70** |
| West Java | 1.35* | 2.04*** | 1.33* | 1.29* | 1.41** | 1.64*** |
| Central Java | 1.16 | 1.21 | 1.05 | 1.26 | 1.60** | 1.06 |
| Yogyakarta | 1.64 | 2.21** | 1.64 | 1.62 | 1.40 | 1.00 |
| East Java | 1.18 | 1.35 | 1.16 | 1.41 | 1.21 | 1.23 |
| Bali | 1.46* | 2.06*** | 1.66* | 1.67* | 1.37 | 2.11*** |
| Kalimantan | | | | | | |
| West Kalimantan | 1.86*** | 1.31* | 1.73*** | 1.96*** | 2.62*** | 1.91*** |
| Central Kalimantan | 0.76 | 0.75 | 0.77 | 0.67 | 0.90 | 1.76 |
| South Kalimantan | 1.04 | 1.65** | 1.50* | 0.90 | 0.92 | 1.11 |
| East Kalimantan | 2.39*** | 1.82** | 3.22*** | 2.77** | 2.28*** | 2.87*** |
| Sulawesi | | | | | | |
| North Sulawesi | 1.39 | 2.35** | 1.71* | 1.03 | 1.05 | 1.73** |
| Central Sulawesi | 1.49* | 1.80* | 1.59* | 1.30 | 1.78*** | 1.15 |
| South Sulawesi | 1.37 | 1.57* | 1.56** | 1.88** | 1.41* | 2.10*** |
| Southeast Sulawesi | 1.84** | 1.38 | 1.63* | 1.60* | 1.13 | 2.13*** |
| Eastern Indonesia | | | | | | |
| West Nusa Tenggara | 1.24 | 1.86** | 1.59** | 1.16 | 1.10 | 1.61** |
| East Nusa Tenggara | 1.21 | 1.09 | 1.74 | 0.95 | 1.16 | 1.42 |
| East Timor | 1.41 | 2.41** | 4.80** | 1.75** | 1.31 | 1.26 |
| Maluku | 1.28 | 2.29** | 1.98** | 2.15*** | 1.63** | 1.79** |
| Irian Jaya | 1.04 | 1.24 | 1.22 | 0.98 | 1.52 | 1.21 |

Source: 1994 IDHS data set, using the Cox regression proportional hazard model.

Notes: [a] The coefficient of reference category is equal 1

* Significant at the five per cent level.

** Significant at the one per cent level.

*** Significant at the 0.1 per cent level.

House type

Type 1: Floor: Tile/ceramic/concrete
Wall : Brick
Roof : Concrete/tile/asbestos/zinc

Type 2: Floor: Concrete/dirt/other
Wall : Brick/bamboo/other
Roof : Concrete/tile/asbestos/zinc

Type 3: Floor: Concrete/dirt/other
Wall : Bamboo/other
Roof : Leaves/other

provinces, the possession of a television and a stove is a significant factor in reducing infant mortality. In East Timor, the possession of a stove is very significant with respect to infant mortality. Children who live in households without a stove are 4.8 times more likely to die during infancy than those who live in households with a stove.

The type of house variable in this study is based on the main material used in the construction of the house. House 'type 1' is categorised as a permanent house, while house 'type 2,3' is categorised as a semi-permanent/non-permanent house. However, the type of house in Indonesia varies in every province. There is a traditional house in each province. The traditional house is made from various materials, which are not always made from the materials that are categorised in this study as a 'good material'. However, the traditional house is very rare nowadays, especially in urban areas.

Table 7.5 shows that children who live in house type 1 are more likely to survive during infancy than those who live in house type 2 or 3, except in some provinces. In Jakarta, the difference in the house type has no effect on infant mortality. This may be because of the small number of house types 2 and 3 (not shown). The effect of the type of house on infant mortality in Central Kalimantan, South Kalimantan, East Nusa Tenggara and Irian Jaya ran counter to the norm. These provinces are categorised as remote and isolated provinces. Therefore, many traditional houses can be found in these provinces.

The source of drinking water is categorised into two groups, pipe/pump and 'others' (e.g. river, streams, and rainwater). Children that drank piped or pumped water had more chance of surviving during infancy than those that consumed water from other sources. This was the case in most provinces, except Bengkulu, Lampung, Central Kalimantan and South Kalimantan. Furthermore, in all provinces children who are born in household which does not have a toilet facility are more likely to die during infancy than those that are born in a household with a toilet facility.

### *7.6.3 Correlation of infant and child mortality with other variables in the provinces*

Table 7.6 shows the correlation between the infant and child mortality rates and selected aggregate variables. As expected, the infant mortality rate and the child mortality rate are related. The total fertility rate (TFR) in the province also has a positive effect on infant and child mortality. The correlation with TFR is more pronounced for child mortality than for infant mortality.

The ratio of doctors, nurses and hospital beds per million people has a negative effect on infant mortality. This means that the more doctors, nurses and hospital beds, the less chance there is of infant mortality. The effect of assistance delivery also has a correlation with infant mortality. The more deliveries attended by doctors the lower is the infant mortality rate. On the other hand, the more deliveries attended by the TBA, the higher the infant mortality rate. The completeness of immunisation has more effect on child mortality than on infant mortality. Furthermore, the availability of toilet facilities has a negative correlation with infant and child mortality rates. Access to

Table 7.6 Correlation coefficient between infant and child mortality rate and selected variables among provinces in Indonesia

| Indicator | Infant mortality | | Child mortality | |
|---|---|---|---|---|
| | r | t | r | t |
| Child mortality | 0.53*** | -11.37 | | |
| Infant mortality | | | 0.53*** | -11.37 |
| Total fertility rate | 0.37** | 16.33 | 0.73*** | 11.92 |
| Doctor per 1000,000 population | -0.36* | 8.69 | 0.37** | -12.32 |
| Nurse per 1000,000 population | -0.36* | -11.64 | -0.08 | 1.84 |
| Hospital bed per 1000,000 population | -0.35* | 9.64 | -0.39** | 10.28 |
| % delivered attended by doctor | -0.36* | -13.69 | - | - |
| % delivered attended by TBA | 0.42** | -2.44 | - | - |
| % complete immunized | -0.21 | 4.66 | -0.52*** | -4.00 |
| % read newspaper | -0.50*** | -11.97 | -0.44** | 5.94 |
| % hear radio | -0.27 | 1.69 | -0.56*** | -0.54 |
| % watch TV | -0.06 | 1.30 | 0.40** | -6.48 |
| % toilet with septic | -0.23 | 10.10 | -0.36* | 3.13 |
| Number of province | 27 | | 27 | |

Source: Primary analysis of the 1994 IDHS
Notes: * Significant at the 10 per cent level.
** Significant at the five per cent level.
*** Significant at the one per cent level.

mass media (newspapers, radio and television) is also significant in reducing child mortality but less so in reducing infant mortality. However, the significant findings for newspapers suggest that written material in the hands of mothers would be a very effective way of reducing mortality.

## 7.7 Summary

West Kalimantan and West Nusa Tenggara were the only provinces that have an infant mortality rates above 100 per thousand births. Since 1980, Jakarta and Yogyakarta have had consistently low mortality rates. Other provinces that have low levels of mortality include Lampung, Central Kalimantan and East Timor. These rates may be underestimated due to non-sampling errors.

The infant mortality varies according to place of residence. Children who live in rural areas are 73 per cent more likely to die during infancy than those who live in urban areas. The highest disparity is found in Sumatra where the differences between rural and urban areas overall is 78 per cent. At the provincial level, the highest ratio of rural to urban infant mortality is found in Maluku and Jambi, 4.93 and 3.55. Some of the urban estimates seem unreliable, and this may due to the small number of cases.

Infant mortality rates greatly vary between provinces. This can only be explained by the provinces' unique socio-economic and demographic characteristics and the availability of health facilities available in different places. There are still many questions that remain unanswered. However, further research at the provincial level, applying qualitative methods, might go far to reveal the socio-cultural setting affect of infant mortality. This is turn could help analysts to understand, and perhaps avoid the non-sampling errors which plague mortality data.

# 8

# Conclusion and policy implications

## 8.1 Methods

The aim of the thesis was to provide coherent estimates of mortality levels and trends and life table survival functions as well as to assess the relative influences of factors associated with infant and child mortality in Indonesia. Since 1971, most estimates of infant and child mortality have been based on indirect estimations calculated from census and survey data, because the vital registration system is weak. This study looks at levels and trends using 1980 and 1990 Censuses, and 1985 and 1995 Intercensal Surveys. Analysis of socio-economic determinants of mortality is based on the 1991 and 1994 Indonesia Demographic and Health Surveys (IDHS).

In the past, the major statistical methods used to analyse multivariate effects of demographic and socio-economic variables on infant and child mortality were forms of linear regression and logistic models. These methods of analysis use the probability of dying (or the survival status) before exact age one and between age one and age five as indicators of mortality. They assume that there are no social, economic or biological differences between those who die right after birth and those who die close to age one. This is likely to be a faulty assumption. Moreover, the reliability and validity of Indonesian data are very low, particularly with regard to the quality of the age reporting of deceased children. To measure infant and child mortality using survey data, estimation methods which utilise all births are more 'efficient' than methods using only a portion of the cases reported. Cox regression, which basically utilises the life table concept avoids the assumptions underlying linear regression or logistic models and maximises the number of cases utilised in the calculations.

This thesis is based on the argument that Cox regression is a powerful tool for handling mortality data. It is a statistical method uses information from all individuals/cases and takes into account specific information on the age at death rather than the proportion dying before a given age. The procedure involves a calculation of "survival data" measuring the precise time between certain reported events such as the time from birth to reported death. It allows estimation of the empirical survival distribution functions and levels irrespective of the age of enumerated children at the time of the survey. In this way we can simultaneously evaluate the effect on infant and child mortality of several socio-economic and demographic covariates using information from all births in the recent past. The distribution of survival time can be described using survival function, therefore more effective summaries of infant and child mortality are produced.

Previous studies using pregnancy history or logistic regression techniques excluded children born less than one year before the survey (for analysing infant mortality) or less than five years before the survey (for analysing child mortality). Restricting analysis in this way has the disadvantage of ignoring substantial amounts of recent information. This is called truncation. It results in small sample sizes and increased standard errors. Exclusion of recent information also means that analysis has difficulty in describing the dynamics of recent social and demographic changes. Life table and Cox regression methods overcome such difficulties by utilising information from all cases in the recent period.

Indirect demographic methods such as Brass methods estimate include all cases but rely on the assumption of stability of mortality and fertility. Brass methods can be used to estimate the level of infant and child mortality over a range of time periods and provinces, but because they are aggregate measure, they are not well suited to multivariate analysis of socio-economic determinants at the individual level.

## 8.2 Mortality trends

The main data sources for estimating infant and child mortality during the colonial era were vital registration system and case studies in selected areas of Java and Madura. Death registration during the colonial era especially in urban areas was more reliable than birth registration. A death certificate from hospital or civil authorities was required for burial. Certificates were also required to prove death as part of the administration of inheritance of property, insurance claims or to establish death from violence. The prevalence of plague and other epidemic disease at the time increased the government's resolve to improve the coverage of registration.

Estimates of infant and child mortality rates were extremely high during the period preceding the Second World War. The infant mortality rates for this period varied from 100 to 300 per thousand births in Javanese cities. In the 1950s, estimates ranged from 148 to 194 per thousand births. Estimates of infant and child mortality after the first modern census in 1961 are regarded as more reliable than those before 1961. During the 1960's, infant mortality rates in Indonesia ranged from 131 to 145 per thousand births, but these figures were known only after the tabulation of the 1971 Census in 1973. Based on the 1973 Indonesia Fertility Mortality Survey, the infant mortality estimate was 140 per thousand births in Java.

Subsequent censuses show continuous decline in estimates of infant mortality in Indonesia. The proportion dead of children reported by ever-married women also fell in every age group. The decline was widespread in all provinces in Indonesia. West Nusa Tenggara maintained the highest reported infant mortality rate among provinces in Indonesia from 1967 to 1995. West Java, which usually had the second highest infant mortality rate, surprised observers in 1995 by recording an infant mortality level of 56, or the same as that of East Java. At the national level, the quality of the 1995 Intercensal Survey seems quite reliable (Figure 4.1), however care must be taken in examining data at the provincial level. The estimates of infant mortality based on the 1985 Intercensal Survey appear to have been severe underestimates.

In an effort to obtain high quality data on fertility and mortality, Indonesia has carried out a series of specialised intensive surveys, beginning with the World Fertility Survey in 1975. The 1991 and 1994 IDHS covered all 27 provinces in Indonesia. These were the second and third of the worldwide Demographic and Health Surveys (DHS) conducted in Indonesia. The fieldwork for the 1991 IDHS was carried out from May to July 1991 while the 1994 IDHS was in the field from July to November 1994. The 1991 sample was based on the 1990 Census while the 1994 IDHS was a sub sample of the 1994 Social Economic National Survey (*Susenas)* which used an updated sample frame. Both surveys collected retrospective birth history data of ever married women aged 15-49. The 1991 IDHS successfully interviewed 22,909 respondents, while 28,168 respondents were interviewed in 1994.

When the Indonesia Government instituted socio-economic policies aimed at significantly improving living conditions in the 1980s, they expected substantial mortality declines. The Cox regression analysis allows us to conclude with some confidence that the 1991 and 1994 IDHS data confirm major declines in infant and child mortality. Nonetheless, the surveys revealed that infant and child mortality rates were highest among women who were uneducated, first married at ages less than 15 years, pregnant at ages below 20 years and married more than once. Infant and child mortality was also higher among those who lived in rural areas, or in Eastern Indonesia and who were unable to speak the Indonesian language.

The lower risk of infant mortality in urban areas may be a reflection of better access to health services and facilities, and better knowledge of disease prevention. In urban areas, mothers were more likely to utilise modern health services during pregnancy, which may reduce the risk of low birth-weight and birth complications, and reduce the risk of infant deaths. The analysis of the determinants of infant and child mortality in this study confirms and extends several previous findings linking development initiatives with mortality reduction.

The differentials of infant and child mortality levels among provinces are not only due to the socio-economic and demographic factors that can be quantified, but are shaped by socio-cultural factors that can only be revealed using qualitative research. For instance mothers in Lombok (West Nusa Tenggara) were quite open in reporting the death of their babies while mothers in some other provinces found it unsettling to mention death (Hull et al., 1995). Such cultural patterns have important implications for studies relying on mothers' reports to estimate mortality. The differences in infant and child mortality among provinces and regions in Indonesia were also due to the large area of the country and wide geographical spread creating a 'demographic mosaic'. The existing wide variation in provincial infant and child mortality in Indonesia shows that there is a need to improve socio-economic and living conditions in the more disadvantaged provinces, particularly in Eastern Indonesia, in order to achieve equity in survival.

At the province level and among individual women many mechanisms through which regional, individual, social and household characteristics influence infant and child mortality remain unexplained, implying a need for sophisticated local research. There is a lack of data on environmental and cultural conditions and specific modes of behavior in high mortality provinces and among high mortality social groups. More in-depth qualitative research is needed to identify specific factors and behavioral patterns leading to high mortality. For instance, research is needed into the relation between child feeding practices, cultural beliefs surrounding diseases, and infant and child mortality.

Maternal education is related to child survival through three proximate determinants: mother's age at birth of the child, parity and the length of the preceding birth interval. It is generally observed that educated mothers tend to have fewer children than uneducated mothers. Education is also likely to raise the age at marriage and hence educated mothers start child bearing at later ages than uneducated mothers. Educated mothers may deliberately space their children in ways that give their children a better chance of survival, by avoiding closely spaced births. This study also shows that educated mothers have better personal hygiene and environment sanitation, and greater utilisation of health services, all behaviour contributing to lower infant and child mortality in Indonesia.

Because the validity and reliability of the available data in Indonesia are not good, the choice of the method for estimating infant and child mortality has a large impact on the usefulness of data for guiding policy. The Cox regression method has produced more robust estimates of infant and child mortality rates and factors affecting infant and child mortality than have other approaches. Therefore, decision makers can be more confident of the empirical foundation of their deliberations when they use this life table based analytical technique.

## 8.3 Policy implications

This study suggests that to meet the goal of further reductions in infant and child mortality in Indonesia, government should give priority to public health services which reach poor people especially in rural areas and poor eastern island provinces. To match the health expenditure levels of neighboring countries, the Indonesian budget for the health sector would need to be doubled from the existing expenditure levels. Health improvement does not necessarily follow from expenditures on health services, but rather combines with economic growth and increasing income per capita to determine health outcomes. The strategy for allocating the budget should be changed from the current policy, which still leads to concentration of services in urban, rich areas to one which will favour low income people who experience the highest infant and child mortality in Indonesia. Such a policy would seek to strengthen health services in rural and isolated regions. The current emphasis on preventive rather than curative approaches to infant mortality is cost-effective, but poor people also need effective curative treatment within geographic and financial reach. The clinics and small hospitals which provide such accessible curative care are also the institutional base for preventive outreach. The impact of such preventive measures goes beyond a single episode of disease and beyond the health of a single individual. The same actions that prevent infants from dying in the first year of life also guarantee them a higher quality of life as they mature.

To make such strategies more effective the existing policies of training traditional birth attendants and placing village midwives (*bidan desa*) need to be reinforced and better integrated in a comprehensive program of health services. In the absence of other medical personnel, *bidan desa* are expected to handle emergency problems. In some rural areas, the *bidan desa* represent the first option for people looking for treatment, especially where there was no health center nearby. *Bidan desa* are also expected to promote the importance of immunisation and vaccination, family planning (avoiding close interval between births, marriage at young ages), use of proper sanitation (such as drinking water, toilet facilities) and consuming nutritious and healthy food especially by pregnant women. Health care expenditure needs to be both increased and disbursed to ensure that such low level health workers have the training and resources to implement this heavy responsibility. The campaign for health awareness and sanitation can be reinforced through media especially written materials, but including radio and television, which already reach remote areas of the nation.

# References


Aaby, Peter. 1989. "Malnutrition Versus Over-crowding in Child Survival." Pp. 351-362 in *International Population Conference*, vol. 1. New Delhi.

Adioetomo, Srimurtiningsih. 1985. *Differential Mortalitas Bayi dan Anak di Jakarta dan Indonesia (Infant and Child Mortality Differential in Jakarta and Indonesia)*, Buku I (Jawa). Jakarta: Biro Pusat Statistik.

Adioetomo, Sri Moertiningsih and Gour L. Dasvarma. 1986. "Levels and Trends of Child Mortality in Indonesia by Province: Based on the 1971 and 1980 Population Censuses." Lembaga Demografi, Fakultas Ekonomi Universitas Indonesia, Jakarta.

Ananta and Arifin. 1991. *Projection of Indonesia Population (1990-2020).* Jakarta: Demographic Institute, University of Indonesia.

Arnold, Fred. 1990. "Assessment of the Quality of Birth History Data in the Demographic and Health Surveys." Institute for Resource Development/Macro System Inc., Columbia, Maryland.

Arriaga, E. and Hobbs F. 1982. "Infant Mortality Differential in Selected East and South Asian Countries." in *Paper presented at the WHO/ESCAP meeting on Mortality in South and East Asia, A Review of Changing Trends and Patterns 1950-1975*. Manila.

Australian Agency for International Development (AusAID). 1996. "Indonesia Program Profile: Australian Development Cooperation with Indonesia." Australia Agency for International Development, Canberra.

Australian Agency for International Development (AusAID). 1997. "Strategic Directions for Australia's Development Cooperation Program With Indonesia 1997/78 to 2001/02." Australia Agency for International Development, Canberra.

Barrera, A. 1990. "The Role of Maternal Schooling and Its Interaction With Public Health Programs in Child Health Production." *Journal of Development Economics* 32: 69-91.

Becker, S. 1984. "A Response Bias in the Reporting of Month of Birth in Pregnancy History Surveys." in *IPD Working Paper 1984-85*. Brussel, Belgium: Vrije Universiteit Brussel, Interuniversity Programme in Demography.

Behm, H. 1991. "An Analytical Framework." Pp. 7-20 in *Child Mortality in Developing Countries: Socio-economic Differentials, Trends and Implication.* New York: Department of International and Economic Affairs, United Nations.

Bendesa, I. K. G. and I. M. Sukarsa. 1980. "Concentration in Indonesia Manufacturing." *Bulletin of Indonesian Economic Studies* 16, 2: 31-53.

Berman, P. A., Gwatkin D. R., and Burgur S. E. 1987. "Community-based Health Workers: Head Start or False Start toward Health for All." *Social Science and Medicine* 25, 5: 443-459.

Bhuiya, Abbas, Kim Streatfield, and A. M. Sarder. 1993. "Mother's Education and Knowledge of Major Childhood Diseases in Matlab, Bangladesh." Pp. 277-292 in *International Population Conference*, vol. 4. Montreal.

Bicego, George T. and J. Ties Boerma. 1991. "Maternal Education and Child Survival: Comparative Analysis of DHS Data." in *Proceedings of the Demographic and Health Surveys World Conference*. Colombia, Maryland: IRD/Macro International Inc.

Bicego, George T. and J. Ties Boerma. 1993. "Demographic Aspects of the Quality of Data on Births in the Demographic and Health Surveys." in *An Assessment of the Quality of Health Data in DHS-I Surveys, DHS Methodological Reports No 2*. Calverton, Maryland: Macro International Inc.

Boerma, J. Ties , A. Elisabeth Sommerfelt, Jeroen K. Van Ginneken, George T. Bicego, M Kathryn Stewart, and Shea O. Rutstein. 1993. "Assessment of the Quality on Health Data in DHS-I Surveys: An Overview." in *An Assessment of the Quality of Health Data in DHS-I Surveys, DHS Methodological Reports No 2*. Calverton, Maryland: Macro International Inc.

Bongaarts, John and R. G. Potter. 1983. "Fertility, Biology and Behaviour: An Analysis of the Proximate Determinants." in *Studies in Population*. New York: Academic Press.

Booth, Anne and Konta Damanik. 1989. "Central Java and Yogyakarta: Malthus Overcome?" Pp. 283-305 in *Unity and Diversity: Regional Economic Development in Indonesia Since 1970*, edited by H. Hill. Singapore: Oxford University Press.

Brotowasisto, Oscar Gish, Ridwan Malik, and Paramitha Sudharto. 1988. "Health Care Financing in Indonesia." *Health Policy and Planning* 3, 2: 131-140.

Brown, Byron Wm. Jr. and Myles Hollander. 1977. *Statistics: Biomedical Introduction*. New York: John Wiley and Sons.

Budiarto and Sunaryo. 1985. "Kematian Bayi dan Anak di Jawa Barat (Infant and Child Mortality in West Java)." Pp. 55-88 in *Analisa Kependudukan Berdasarkan Data Sensus Penduduk 1980*, Buku I (Jawa). Jakarta: Biro Pusat Statistik.

Caldwell, J.C. 1979. "Education as a Factor in Mortality Decline: An Examination of Nigerian Data." *Population Studies* 33, 3: 395-413.

Caldwell, J.C. 1986. "Routes to Low Mortality in Poor Countries." *Population Development Review* 12: 171-220.

Caldwell, J.C. 1990. "Cultural and Social Factors Influencing Mortality in Developing Countries." *The Annals of the American Academy of Political and Social Science* 510: 45-59.

Caldwell, J.C. and Peter McDonald. 1981. "Influence of Maternal Education on Infant and Child Mortality: Levels and Causes." in *International Population Conference, 2, Solicited Papers, Manila 1981*. Lie'ge, Belgium: IUSSP.

Casterline, J., E. Cooksey, and A. F. Ismail. 1989. "Household Income and Child Survival in Egypt." *Demography* 26, 1: 15-35.

Central Bureau of Statistics (CBS). 1982. *Penduduk Indonesia: Hasil Sub-sampel Sensus Penduduk 1980 (Population of Indonesia: Result of the Sub-sample of the 1980 Population Census)*. Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1987. *Penduduk Indonesia: Hasil Survei Penduduk Antar Sensus 1985 (Population of Indonesia: Result of the 1985 Intercensal Population Survey).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1988. *Perkiraan Angka Kelahiran dan Kematian, Hasil Survey Penduduk Antar Sensus 1985.* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1991. *Pedoman Pewawancara Survei Demografi dan Kesehatan Indonesia 1991 (Interview Manual the 1991 Indonesia Demographic and Health Survey).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1992a. "Indonesia Demographic and Health Survey, 1991." Central Bureau of Statistics, National Family Planning Board, Ministry of Health, Macro International Inc., Jakarta.

Central Bureau of Statistics (CBS). 1992b. *Profil Statistik Ibu dan Anak di Indonesia 1991 (1991 Statistical Profile of Mothers and Children in Indonesia).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1992c. *Penduduk Indonesia: Hasil Sensus Penduduk 1990 (Population of Indonesia: Result of the 1990 Population Census).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1993a. *Indikator Kesejahteraan Rakyat 1992 (1992 Welfare Indicators).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1993b. *Profil Kependudukan Indonesia (Indonesia Population Profile).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1994a. *Indikator Sosial Wanita Indonesia 1993 (1993 Social Indicators of Indonesian Women).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1994b. *Pedoman Pewawancara Survei Demografi dan Kesehatan Indonesia 1994 (Interview Manual the 1994 Indonesia Demographic and Health Survey).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1995a. "Indonesia Demographic and Health Survey, 1994." Central Bureau of Statistics, National Family Planning Board, Ministry of Health, Macro International Inc., Jakarta.

Central Bureau of Statistics (CBS). 1995b. *Statistik Dalam 50 Tahun Indonesia Merdeka (Statistics in 50 Years Independent of Indonesia).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1995c. *Indikator Kesejahteraan Rakyat 1994 (1994 Welfare Indicators).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1996a. *Statistik Indonesia 1991 (Statistical Pocket Book of Indonesia 1995).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1996b. *Keadaan Ekonomi Indonesia 1996 dan Perkiraan Ekonomi 1997 (The 1996 Economic Condition and the 1997 Prediction.* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1996c. *Penduduk Indonesia: Hasil Survei Penduduk Antar Sensus (Population of Indonesia: Result of the 1995 Intercensal Population Survey).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1996d. *Produk Domestik Regional Bruto Propinsi-Propinsi di Indonesia Menurut Lapangan Usaha 1993-1995 (Gross Regional Domestic Product of Provinces in Indonesia by Industrial Origin 1993-1995).* Jakarta: Central Bureau of Statistics.

Central Bureau of Statistics (CBS). 1997. *Indikator Kesejahteraan Rakyat 1996 (1996 Welfare Indicators).* Jakarta: Central Bureau of Statistics.

Chen, Lincoln, E. Huq, and S. D'Souza. 1981. "Sex Bias in the Family Allocation of Food and Health Care in Rural Bangladesh." *Population Development Review* 7, 1: 55-70.

Chidambaram, V.C. and Zeba A. Sathar. 1984. "Age and Date Reporting." International Statistical Institute, Voorburg, Netherland.

Cho, Lee-Jay, Sam Suharto, G. McNicoll, and S. G. M. Mamas. 1976. *Estimates of Fertility and Mortality in Indonesia Based on the 1971 Population Census.* Honolulu: East West Centre.

Cleland, John G. and Jerome K. Van Ginneken. 1988. "Maternal Education and Child Survival in Developing Countries: The Search for Pathways of Influence." *Social Science and Medicine* 27, 12: 1357-1368.

Cleland, John G. and Jerome K. Van Ginneken. 1989. "Maternal Schooling and Childhood Mortality." *Journal of Biosocial Science* Supplement , Vol. 10: 13-34.

Cochrane, S., D. J. O'Hara, and J. Leslie. 1980. "The Effect of Education on Health." World Bank, Washington D.C.

Corner, Lorraine. 1989. "East and West Nusa Tenggara: Isolation and Poverty." Pp. 179-206 in *Unity and Diversity: Regional Economic Development in Indonesia Since 1970*, edited by H. Hill. Singapore: Oxford University Press.

Corner, Lorraine and Yulfita Raharjo. 1995. "New Direction in Health Policy in Indonesia: The Need for Demand-Oriented Perspective." Pp. 77-103 in *Health & Development in South East Asia*, edited by Paul Cohen and J. Purcal. Canberra: Australian Development Studies Network.

Cox, D. R. 1972. "Regression Models and Life Tables (with Discussion)." *Journal of the Royal Statistics Society* 34, 2: 187-220.

Cox, D. R. and D. Oakes. 1984. *Analysis of Survival Data.* New York: Chapman and Hall.

Da Vanzo, J., J.P. Habicht, and W.P. Butz. 1984. "Assessing Socioeconomic Correlates of Birth Weight in Peninsular Malaysia: Ethnic Differences and Change Over Time." *Social Science and Medicine* 18.

Daroesman, R. 1972. "An Economic Survey of West Java." *Bulletin of Indonesian Economic Studies* 8, 2: 29-54.

Dasvarma, G. L. 1983. "Indonesian Infant Mortality Estimates for 1980 from Last Live Birth Data." Pp. 141-163 in *Seminar on Infant Mortality Rate in Indonesia.* Jakarta: Central Bureau of Statistics.

Dasvarma, G. L. and T. H. Hull. 1984. "Estimation of Fertility in Indonesia 1980 From Last Live Birth Data." *Majalah Demografi Indonesia* XI, 22: 33-47.

Djelantik, I. G. G., Sda. Soesbandoro, Erika G., I. K. Gerudug, Widodo J. P., and Siti Pariani. 1995. "Factor-Factor Penyebab yang Berhubungan dengan Kematian Bayi di Lombok (Factors Influencing Infant Mortality in Lombok Island)." in *Seminar and Workshop on Maternal and Child Survival*. Mataram.

D'Souza, S. and Abbas Bhuiya. 1982. "Socio-economic Mortality Differential in Rural Area of Bangladesh." *Population and Development Review* 8, 4: 753-770.

D'Souza, S. and L. Chen. 1979. "Sex Biases of Mortality Differential in Rural Bangladesh." International Centre for Diarrhoeal Research, Bangladesh.

Eisner, V., J. V. Brazie, M. W. Pratt, and A. C. Hexter. 1979. "The Risk of Low Birthweight." *American Journal of Public Health* 69, 9: 887-893.

Elandt-Johnson, R.C. and Johnson N.L. 1980. *Survival Model and Data Analysis*. New York: John Wiley & Sons.

El-Badry, M.A. 1969. "Higher Male and Female Mortality in Some Countries of South Asia." *Journal of the American Statistical Association* 64, 325: 1234-1244.

Ewbank, D., R. Henin, and J. Kekovole. 1986. "An Integration of Demographic and Epidemologic Research on Mortality in Kenya." in *Determinants of Mortality Change and Differentials in Developing Countries*. New York: United Nations.

Fortney, J. A. and J. E. Higgins. 1984. "The Effect of Birth Interval on Perinatal Survival and Birth Weight." *Public Health* 98.

Fosu, G. B. 1989. "Access to Health Care in Urban Areas of Developing Societies." *Journal of Health and Social Behaviour* 30, 4: 398-411.

Frankenberg, Elizabeth A. 1992. "Infant and Child Mortality in Indonesia : the Impact of Access to Health Facilities and Other Community Characteristics on Mortality Risks." PhD Thesis, University of Pennsylvania.

Gardiner, Peter. 1975. "Measurement of Fertility, Mortality and Population Growth." *Majalah Demography* 3, 2: 86-102.

Gardiner, Peter. 1978. "A Note on Fertility Pattern Based on Result of the Indonesian Sample Vital Registration Project 1974-1977." Indonesia Population Dynamics Project, Population Institute, Gajah Mada University, Yogyakarta.

Gardiner, Peter. 1981. "Vital Registration in Indonesia: A Study of the Completeness and Behavioral Determinants of Reporting of Births and Deaths." PhD Thesis, Department of Demography, The Australian National University, Canberra.

Government of Indonesia (GOI). 1993. *Garis-garis Besar Haluan Negara 1993-98*. Jakarta: Sinar Grafika.

Grant, J. P. 1988. *The State of the World's Children*. New York: UNICEF and Oxford University Press.

Gubhaju, Bhakta B. 1984. "Demographic and Social Correlates of Infant and Child Mortality in Rural Nepal." PhD Thesis, Department of Demography, The Australian National University, Canberra.

Gubhaju, Bhakta B. 1986. "Effect of Birth Spacing on Infant and Child Mortality in Rural Nepal." *Journal Biosocial Science* 18: 435-447.

Gubhaju, Bhakta B., Kim Streatfield, and A.K. Majumder. 1991. "Socio-economic, Demographic and Environmental Determinants of Infant Mortality in Nepal." *Journal Biosocial Science* 23, 4: 425-435.

Gunawan, Nardho, Rachmi Untoro, M. Djuhari W., and Sri Harijati H. 1992. *The Role of the Private Sector and Nongovernmental Organizations in the Provision of Health Care and Family Planning Services in Indonesia.* Jakarta: Demographic Institute, Faculty of Economics, University of Indonesia.

Gursoy-Tezcan, A. 1992. "Infant Mortality: A Turkish Puzzle ?" *Health Transition Review* 2, 2: 131-149.

Hardjono, Joan and Hal Hill. 1989. "West Java: Population Pressure and Regional Diversity." Pp. 255-282 in *Unity and Diversity: Regional Economic Development in Indonesia Since 1970*, edited by H. Hill. Singapore: Oxford University Press.

Hartanto, Wendy. 1991. "Effect of Birth Spacing on Childhood Mortality in Indonesia." MA Thesis, National Centre for Development Studies, The Australian National University, Canberra.

Hill, H. 1987. "Concentration in Indonesia Manufacturing." *Bulletin of Indonesian Economic Studies* 23, 2: 71-100.

Hobcraft, John and John McDonald. 1984. *Birth Interval*, vol. 28 (March). The Netherlands, Voorburg: International Statistical Institute.

Hobcraft, J., J.W. McDonald, and S.O. Rutstein. 1983. "Child Spacing Effect on Infant and Early Child Mortality." *Population Index* 49, 4: 585-618.

Hobcraft, J., J.W. McDonald, and S.O. Rutstein. 1985. "Demographic Determinants of Infant and Early Child Mortality: A Comparative Analysis." *Population Studies* 39, 3: 363-385.

Hobcraft, J.N., J.W. McDonald, and S.O. Rutstein. 1984. "Socio-economic Factors in Infant and Child Mortality: A Cross-National Comparison." *Population Studies* 38, 2: 193-223.

Hugo, Graeme J., Terence H. Hull, Valerie J. Hull, and Gavin W. Jones. 1987. *The Demographic Dimension in Indonesia Development.* Singapore: Oxford University Press.

Hull, Terence H. and Bhakta Gubhaju. 1986. "Multivariate Analysis of Infant and Child Mortality in Java and Bali." *Biosocial Science* 18, 1: 109-118.

Hull, T. H., V. J. Hull, and M. Singarimbun. 1977. "Indonesia's Family Planning Story: Success and Chalange." *Population Bulletin* 32, 6.

Hull, Terence H. and Ida Bagus Mantra. 1981. "Indonesia Changing Population." in *The Indonesian Economic During the Soeharto Era*, edited by A. Booth and P. McCawley. Kuala Lumpur: Oxford University Press.

Hull, Terence H., John Rode, and Alan D. Lopez. 1981. "A Framework for Estimating Causes of Death in Indonesia: Causes of Death in Indonesia." *Majalah Demografi Indonesia* VIII, 15: 77-125.

Hull, Terence H. and Jon E. Rohde. 1980. "Prospect for Rapid Decline of Mortality Rates in Java: A Study of Causes of Death and the Feasibility of Policy Interventions for Mortality." Population Studies Center, Gajah Mada University, Yogyakarta.

Hull, Terence H., Roosmalawati Rusman, and Erniati Djohan. 1995. "They Simply Die: Searching for the Cause of High Infant Mortality in Lombok." Demography, RSSS, ANU, Canberra and PPT-LIPI, Jakarta., Canberra and Jakarta.

Hull, Terence H. and Sunaryo. 1978. "Levels and Trends of Infant and Child Mortality in Indonesia." Lembaga Kependudukan Universitas Gajah Mada, Yogyakarta.

Hull, Terence H. and J. Hull Valerie. 1995. "Health System in Indonesia and Vietnam: Transition to Uncertain Future." Pp. 120-148 in *Health & Development in South East Asia*, edited by Paul Cohen and J. Purcal. Canberra: Australian Development Studies Network.

Institute for Resource Development, (IRD). 1987. "Demographic and Health Surveys Data Processing Manual." Institute for Resource Development, Columbia, Maryland.

Irfan, Mohammad. 1986. "Mortality Trend and Pattern in Pakistan." in *Mortality and Health Issues*, *Asian Population Studies Series No. 72*. Bangkok: Economic and Social Commission for Asia and the Pacific and United Nations.

Islam, I and H. Khan. 1986. "Spatial Patterns of Inequality and Poverty in Indonesia." *Bulletin of Indonesian Economic Studies* 22, 2: 80-102.

Jain, A. K. 1985. "Determinant of Regional Variation in Infant Mortality in Rural India." *Population Studies* 39, 3: 407-424.

Jones, Gavin W. 1988. "Urbanization Trends in Southesat Asia: Some Issues for Policy." *Journal of Southeast Asian Studies* XIX, 1: 137-154.

Jones, Gavin W. 1995. "Introduction of the People, Land and Sea: Development Challenges in astern Indonesia." Pp. 59-72 in *People, Land and Sea*, edited by G. W. Jones and Y. Raharjo. Canberra: Demography Program, Research School of Social Science, Australian National University.

Kabir, M. 1978. "Estimation of Mortality of Indonesia for the Period 1961-1971 from Intercensal Survivorship Ratio." *Majalah Demography Indonesia* V, Desember (10): 71-81.

Kadarusman, Julianti. 1982. "Infant and Child Mortality in Java and Bali." MA Thesis, The Australian National University, Canberra.

Kasto. 1983. "Estimates of Infant Mortality Rates in Indonesia." Pp. 162-174 in *Seminar Tingkat Kematian Bayi di Indonesia*. Jakarta: Central Bureau of Statistics.

Kompas Online. 3 November 1997. "The IMF Reformation Package." in *http://www.kompas.com/*.

Kompas Online. 6 February 1997. "Wahyu Nusantaraaji, Jadi Penduduk Ke-200 Juta (Wahyu Nusantaraaji is the 200 millionth population." in *http://www.kompas.com/*. Jakarta.

Kompas Online. 9 September 1997. "Tahun 2005, Orang Miskin di Bawah Lima Persen (In Year 2005, the Poor Peoples Under Five Per cent)." in *http://www.kompas.com/*. Jakarta.

Kompas Online. 10 September 1997. "KTI Butuh Menteri Khusus? (Does Eastern Indonesia need Special Minister?)." in *http://www.kompas.com/*. Jakarta.

Kompas Online. 11 January 1998. "Permasalahan Kini Bukan Lagi Menyangkut Moneter: Prof Dr Sumitro Djojohadikusumo." in *http://www.kompas.com/*. Jakarta.

Kompas Online. 12 November, 1997. "Monetary Crisis Enables Social Upheaval." in *http://www.kompas.com/*. Jakarta.

Kompas Online. 16 January 1998. "Isi Nota Kesepakatan IMF - Pemerintah Indonesia (the IMF Package)." in *http://www.kompas.com/*. Jakarta.

Kompas Online. 21 December 1997. "Korban Meninggal di Irja 653 Orang (The Casualty in Irja 653 Peoples)." in *http://www.kompas.com/*. Jakarta.

Kompas Online. 22 September 1997. "Tighten Your Belts, We Are Entering The Recession: Analysis Kwik Kian Gie." in *http://www.kompas.com/*. Jakarta.

Lee, Elisa T. 1989. *Statistical Methods for Survival Data Analysis*. California: Life Time Learning Publication.

Mahadevan, K. 1986. "Mortality, Biology and Society: Analytical Framework." Pp. 239-301 in *Fertility and Mortality, Theory Methodology and Empirical Issues*, edited by K. Mahadevan, P. J. Reddy, and D. A. Naidu. New Delhi, Beverly Hill: Sage Publications.

Majumder, A. K. 1989. "Determinant of Infant and Child Mortality in Bangladesh." PhD Thesis, Department of Demography, The Australian National University, Canberra.

Majumder, A. K. and Shaficul Islam. 1993. "Socio-economic and Environmental Determinants of Child Survival in Bangladesh." *Journal Biosocial Science* 25, 3: 311-318.

Martin, L.G., J. Trussell, F.R. Salvail, and N.M. Shah. 1983. "Covariates of Child Mortality in the Philippines, Indonesia and Pakistan: An Analysis Based on Hazard Models." *Population Studies* 37, 3: 417-432.

McDonald, Peter. 1978. "The Age Pattern of Mortality in Indonesia: Comment,." *Majalah Demography Indonesia* V, Juni (9): 1-8.

McDonald, Peter F., Mohammad Yasin, and Gavin W. Jones. 1976. "Levels and Trends in Fertility and Childhood Mortality in Indonesia." Demographic Institute, Faculty of Economics, University of Indonesia.

McNicoll, Geoffrey and S.G.M. Mamas. 1973. "The Demographic Situation in Indonesia." , vol. 28. Honolulu: Population Institute, East West Centre.

Meegama, S. A. 1980. "Socio-economic Determinants of Infant and Child Mortality in Sri Lanka: An Analysis of Post War Experience." , London.

Miller, J., J. Trussell, A. R. Pebley, and B. Vaughan. 1991. "Birth Spacing and Child Mortality in Bangladesh and the Philippines: How Much is Explained by Gestation." *Office of Population Research Working Paper* 91-9.

Ministry of Health (MOH). 1993. *The Trend Assessment of Health Development in Indonesia*. Jakarta: Minister of Health.

Ministry of Health (MOH). 1994a. *Indonesia Health Profile 1993*. Jakarta: Ministry of Health.

Ministry of Health (MOH). 1994b. *Rencana Pelita ke Enam Bidang Kesehatan 1994/95 - 1998/99*. Jakarta: Ministry of Health.

Mitra, S.N. 1979. "Infant and Child Mortality in Bangladesh." MA Thesis, The Australian National University, Canberra.

Mosley, W. Henry. 1985. "Biological and Socio-economic Determinants of Child Survival, A Proximate Determinants Framework Integrating Fertility and Mortality Variables." in *International Population Conference*. Liege, Belgium: IUSSP.

Mosley, W. H. and L. C. Chen. 1984. "An Analytical Framework for the Study of Child Survival in Developing Countries." Pp. 25-48 in *Child Survival Strategies for Research, Population and Development Review*, vol. 10 (Suppl.), edited by W. H. Mosley and L. C. Chen.

Muhuri, Pradip K. and Jane Menken. 1997. "Aderse Effects of Next Birth, Gender, and Family Composition on Child Survival in Rural Bangladesh." *Population Studies* 51: 279-294.

National Family Planning Coordinating Board (NFPCB). 1995. *25 Years Family Planning Movement*. Jakarta: National Family Planning Board.

National Urban Development Strategic (NUDS). 1985. *NUDS Final Report*. Jakarta.

Newland, Kathleen. 1981. *Infant Mortality and the Health of Societies*: Worldwatch Institute.

Nitisastro, Widjojo. 1970. *Population Trends in Indonesia*. Ithaca and London: Cornell University Press.

Norren, V. B. and H. A. W. Vianen. 1986. *The Malnutrition-Infections Syndrome and its Demographic Outcome in Developing Countries*. The Hague: Programming Committee for Demographic Research, Publication No. 4.

Okojie, Christina E.E. 1993. "Some Inter Relationship Between Maternal Education and Child Survival and Focus Group Discussions." in *International Population Conference*. Montreal.

Olsen, R. J. and K. I. Wolpin. 1983. "The Impact of Exogenous Child Mortality on Fertility: A Waiting Time Regression with Dynamic Regressors." *Econometrika* 51: 731-751.

Oni, Gbolahan A. 1988. "Child Mortality In a Nigeria City: Its Level and Socioeconomic Differentials." *Social Science Medical* 27, 6: 607-614.

Orubuloye, I. O. and J.C. Caldwell. 1975. "The Impact of Public Health Services on Mortality: A Study of Mortality Differentials in a Rural Area of Nigeria." *Population Studies* 29, 2: 259-272.

Poernomo, Sonja. 1985. "Primary Health Care in Indonesia." in *Rural Health Research for Primary Health Care in Southeast Asia*, edited by D. C. Reynolds and C. Harinasuta. Bangkok: SEAMEO-TROMED.

Preston, S. H. 1978. *The Effect of Infant and Child Mortality on Fertility*. New York: Academic Press.

Preston, S. H. 1985. "Mortality and Development Revisited." Pp. 97-122 in *Quantitative Studies of Mortality Decline in Developing World*, vol. 8, edited by J. Davanzo, J. P. Habicht, K. Hill, and S. H. Preston. Washington D.C.: World Bank.

Retherford, Roberd D. and Minja Kim Choe. 1993. *Statistical Model for Causal Analysis*. New York: John Wiley & Sons, Inc.

Reyes, F. L. 1981. "Evaluation of the Republic of the Philippines Fertility Survey 1978: WFS Scientific Reports." World Fertility Survey, Voorburg, Netherlands.

Rutstein, S.O. 1984a. "Infant and Child Mortality: Levels, Trends, and Demographic Differentials." International Statistical Institute, Voorburg, Netherlands.

Rutstein, S.O. 1984b. "Socio-economic Differential in Infant and Child Mortality." World Fertility Survey Comparative Studies, Voorburg, Netherlands.

Ruzicka, Lado and Penny Kane. 1990. "Health Transition: The Course of Morbidity and Mortality." Pp. 1-26 in *What We Know about Health Transition: The Cultural, Social and Behavioral Determinants of Health*, vol. 1, edited by J. Caldwell, S. Finley, P. Caldwell, G. Santow, W. Cosford, J. Braid, and D. Broers-Freeman. Canberra: Health Transition Center, The Australian National University.

Ruzicka, L. T. and A. K. M. Alauddin Chowdhury. 1978. "Method and Procedure: Demographic Surveilance System-Matlab." Cholera Research Laboratories, Dacca.

Ruzicka, L. T. and P. Kane. 1987. "Infant and Child Mortality: The Implication for Fertility Behaviour." in *Population Policy and Programmes*. New York: United Nations.

Sandiford, P., J. Cassel, M. Montenegro, and G. Sanchez. 1995. "The Impact of Women's Literacy on Child Health and Its Interaction with Access to Health Services." *Population Studies* 49, 1: 5-17.

Sastrasuanda, Toto E. 1971. "Fertility and Mortality in Indonesia." Demographic Training and Research Centre, Bombay.

Schultz, T. P. 1984. "Studying the Impact of Household Economic and Community Variables on Child." *Population Development Review* 10 (Suppl.): 215-235.

Shah, F. K. and H. Abbey. 1973. "Effect of Some Factors on Neonatal and Post-neonatal Mortality." *Milbank Memorial Fund Quarterly Bulletin* 49: 33-57.

Shah, N, M, and M.A. Shah. 1990. "Socio-economic and Health Care Determinants of Child Survival in Kuwait." *Journal of Biosocial Sciences* 22, 2: 239-253.

Sigit, H and Suparman I. A. 1986. "Indikator Kualitas Hidup Manusia Indonesia (Indicator of Quality of Life of Indonesia)." in *Fourth National Science Congress*. Jakarta.

Simmons, G. B., Smucker C., Bernstein s., and Jensen E. 1982. "Post-neonatal Mortality in Rural India: Implications of an Economic Model." *Demography* 19, 3: 371-389.

Singh, S. 1987. "Evaluation of Data Quality." in *The World Fertility Survey An Assessment*, edited by J. Cleland and C. Scott. Oxford: Oxford University Press.

Sinquefield, Jeanne C. and Azwini Kartoyo. 1977. "Using Retrospective Mortality Data to Test the Applicability of Model Life Tables fo Indonesia." *Majalah Demography Indonesia* 4, 7 June, 1977: 25-41.

Soemantri, S. 1983. "Trends and Differentials of Regional Infant Mortality Rate." Pp. 175-192 in *Seminar on Infant Mortality Rate in Indonesia.* Jakarta: Central Bureau of Statistics.

Soemantri, S. 1987. "Angka Kematian Bayi di Indonesia: Tingkat Kecenderungan dan Prospeknya." in *The Indonesian Statistical Association Congress.* Jakarta: Central Bureau of Statistics.

Spiers, P. S. and L. Wang. 1976. "Short Pregnancy Interval, Low Birth Weight and the Sudden Infant Death Syndrome." *American Journal of Epidemiology* 104.

Streatfield, Kim. 1986. *Fertility Decline in a Traditional Society: The Case of Bali.* Canberra: The Australian National University.

Streatfield, Kim and Lulu Bost. 1990. *Short Birth Interval and Pregnancy Outcome.* Canberra: International Population and Dynamics Program Department of Demography, The Australian National University.

Streatfield, Kim and Miranda Korzy. 1987. *Trends in Drinking Water and Sanitation Facilities and Impact on Infant and Child Mortality in East Java.* Canberra: International Population and Dynamics Program Department of demography, The Australian National University.

Suara Pembaruan Online. 10 October 1997. "Rupiah Terus Menguat (Rupiah Strengthened)." in *http://www.suarapembaruan.com/News/1997/10/101097/Headline/index.html.* Jakarta.

Suara Pembaruan Online. 22 January 1998. "Dolar AS Tembus Rp 16.500 (US Dollar Break Through Rp 16,000." in http://www.suarapembaruan.com/News/1998*/01/220198/Headline/hl04/hl04.html.* Jakarta.

Subekti, L and I. Putu Suardi. 1984. "Laporan Penelitian Pengaruh Faktor Social-ekonomi Terhadap Tingkat Mortalitas di Nusa Tenggara Barat (Research Report on the Influence of Socio-economic Factors on Mortality in West Nusa Tenggara)." , Mataram, Indonesia.

Suhartono, P and Hadma Ali Suardi. 1970. "Estimation of Mortality of the rural Population of Java Madura 1964." Demographic Training and Research Centre, Bombay, India.

Sujono, Harjono. 1974. *The Adoption of an Innovation in A Developing Country: The Case of Family Planning in Indonesia.* Chicago: Community and Family Study Center.

Sullivan, Jeremiah M., George Bicego, and Shea Oscar Rutstein. 1990. "Assessment of the Quality of Data Used for the Direct Estimation of Infant and Child Mortality in the Demographic and Health Surveys. In An Assessment of DHS-I Data Quality." IRD/Macro Systems, Inc., Columbia, Maryland.

Sullivan, Jeremiah M. and Stephen E. Wilson. 1982. "The Baseline Round of the East Java Population Survey: A Final Report, Serie SKJT 1980-1982." Biro Pusat Statistik, Jakarta.

Sunaryo. 1978. "Metode Perkiraan Mortalitas ( Method of Estimating Mortality)." Indonesian Population Dynamic Project Population, Institute, Gajah Mada University, Yogyakarta.

Supraptilah, B. 1982. "Evaluation of the Indonesian Fertility Survey 1976: WFS Scientific Reports." World Fertility Survey, Voorburg, Netherlands.

Supraptilah, Bondan and Budi Suradji. 1979. "Pengaruh Perbedaan Ekonomi Terhadap Fertilitas dan Mortalitas Masa Kanak-Kanak di Indonesia." in *Survey Fertilitas Mortalitas Indonesia*, vol. Monograph No. 6. Jakarta: Lembaga Demografi, Fakultas Ekonomi, Universitas Indonesia.

Sydney Morning Herald Online. October 10, 1997. "EDITORIAL : Indonesia and the IMF." in *http://www.smh.com.au/daily/content/971010/columns/columns1.html.* Sydney.

Tekce, Belgin and Frederic C. Shorter. 1984. "Determinants of Child Mortality: A Study of Squatter Settlements in Jordan." in *Population and Development Review*, vol. 10 (Suppl.), edited by W. Henry Mosley and L. C. Chen. New York: Population Council.

Thapa, S. and R. Retherford. 1982. "Infant Mortality Estimate Based on 1976 Nepal Fertility Study." *Population Studies* 36, 1: 61- 80.

The Age Online. 13 January 1998. "The IMF pill may be more curse than cure." in *http://www.theage.com.au/daily/980113/.* Melbourne.

The Australian Financial Review (Greg Earl). 16 January, 1998. "Soeharto Yield to IMF: Out-in-cold Jakarta Banks on Reform Package." Pp. 1 in *The Australian Financial Review.* Sydney.

Timmer, Marteen. 1961. "Child mortality and population pressure in the D.I. Jogjakarta, Java, Indonesia." PhD Thesis, University of Amsterdam, Amsterdam.

Torday, J. S., H.C. Nielson, and M.D. Fencl. 1981. "Sex Differential in Fetal Lung Maturation." *American Review Respiratory Disease* 123: 205-208.

Trussell and Hammerslough C. 1983. "A Hazard Model Analysis of the Covariates of Infant and Child Mortality in Sri Lanka." *Demography* 10, 1: 1-26.

United Nations (UN). 1982. *Levels and Trends of Mortality Since 1950: A Joint Study by the United Nations and the World Health Organisation.* New York: United Nations.

United Nations (UN). 1984. *Mortality and Health policy.* New York: United Nations.

United Nations (UN). 1985. *Socio-economic Differentials in Child Mortality in Developing Countries.* New York: United Nations.

United Nations (UN). 1986. "Determinants of Mortality Change and Differentials in Developing Countries: The Five Countries Case Study Project." *Population Studies* 94, New York.

United Nations (UN). 1987. *Mortality and Health Issues in Asia and the Pacific*, vol. 78. Bangkok: ESCAP.

United Nations Children's Fund (UNICEF). 1996. *Learning and Growing in Partnership for Children.* Jakarta: UNICEF.

United State Bureau of the Census. 1994. *World Population Profile: 1994*, Report WP/94, Edited by A. Jamison and F. Hobbs. Washington DC: United State Government Printing Office.

Utomo, Budi. 1982. "Mortality Trends and Differentials in Indonesia 1950-1975." Pp. 297-325 in *Mortality in South and East Asia: A Review of Changing Trends and Patterns. 1950-1975*. Manila, the Philippines: WHO/ESCAP.

Utomo, Budi, Sudibyo Alimoeso, and Chai Bin Park. 1983. "Factors Affecting the Use and Non Use of Contraception." *Majalah Demografi Indonesia* X, 20: 19-48.

Utomo, Budi and S. Hadmadji. 1983. "Factor yang Mempengaruhi Kelangsungan Hidup Anak di Pedesaan Jawa Timur dan Jawa Barat." *Majalah Demografi Indonesia* X, 19: 61-84.

Utomo, Budi and Meiwita Budiharsana Iskandar. 1986. "Mortality Transition in Indonesia 1950-1980." in *Mortality and Health Issues, Asian Population Studies Series No. 74*. Bangkok: Economic and Social Commission for Asia and the Pacific and United Nations.

Utomo, Budi and Meiwita Budiharsana Iskandar. 1989. "Socio-economic Differentials in Infant and Child Mortality in Indonesia in the 1970s: Trends, Causes, and Implications." Pp. 145-155 in *Differential Mortality: Methodological Issues and Biosocial Factors*, edited by Lado Ruzicka, G. Wunsch, and P. Kane: Clarendon Press, Oxford.

Waldron, Ingrid. 1983. "The Role of Genetic and Biological Factors in Sex Differences in Mortality." Pp. 141-164 in *Sex Differentials in Mortality: Trend, Determinants and Consequences*, edited by Alan D. Lopez and L. T. Ruzicka. Canberra: The Australian National University.

Ware, H. 1984. "Effect of Maternal Education, Women's Roles and Child Care on Child Mortality." in *Child Survival Strategies for Research, Population and Development Review*, vol. 10 (Suppl.), edited by W. H. Mosley and L. C. Chen.

Winikoff, B. and M. A. Castle. 1987. "The Maternal Depletion Syndrome: Clinical Diagnosis or Eco-demographic Condition?" in *International Conference on Better Health for Women and Children through Family Planning*. Nairobi, Kenya: Unpublished.

World Bank. 1991. "Indonesia: Health Planning and Budgeting." World Bank, Washington, D.C.

World Health Organisation (WHO). 1985. *Health Care in South-East Asia*. New Delhi: WHO Regional Office for South-East Asia.

Yahya, Soejono. 1985. "Primary Health Care in the Indonesian National Health System." in *Rural Health Research for Primary Health Care in Southeast Asia*, edited by D. C. Reynolds and C. Harinasuta. Bangkok: SEAMEO-TROMED.

Yates, Frank. 1981. *Sampling Method for Censuses and Surveys*. London: Charles Griffin & Company LTD.

Yatim, Mohamad M. 1982. "Evaluation of Malaysian Fertility and Family Survey 1974." .

# Appendix tables

Table A.3.1 National inflation according to expenditure group, 1951-68

| | Expenditure group | | | | |
|---|---|---|---|---|---|
| Year | Food | Housing | Cloth | Services | Total |
| 1951 | 80.00 | 11.48 | -15.56 | 7.27 | 34.88 |
| 1952 | -9.26 | 0.00 | 1.32 | 13.56 | -1.72 |
| 1953 | 6.12 | 2.94 | 9.09 | 7.46 | 5.26 |
| 1954 | 11.54 | 5.71 | 34.52 | -1.39 | 11.67 |
| 1955 | 31.03 | -1.35 | 28.32 | 16.90 | 23.88 |
| 1956 | 2.63 | 2.74 | -6.21 | 1.20 | 0.00 |
| 1957 | 61.54 | 13.33 | 11.03 | 14.28 | 42.17 |
| 1958 | 10.32 | 35.29 | 23.84 | 35.42 | 17.80 |
| 1959 | 4.32 | 18.26 | 95.72 | 24.62 | 19.42 |
| 1960 | 22.76 | 20.59 | 56.56 | 28.40 | 29.52 |
| 1961 | 123.03 | 90.24 | -0.87 | 30.77 | 76.74 |
| 1962 | 128.97 | 112.82 | 267.96 | 219.82 | 154.40 |
| 1963 | 154.56 | 59.19 | 73.59 | 123.10 | 128.07 |
| 1964 | 127.83 | 143.61 | 163.84 | 137.97 | 135.13 |
| 1965 | 685.36 | 567.34 | 322.56 | 500.30 | 594.44 |
| 1966 | 500.23 | 866.34 | 854.76 | 1128.07 | 635.35 |
| 1967 | 146.22 | 148.91 | 38.69 | 50.96 | 112.17 |
| 1968 | 64.70 | 69.59 | 157.74 | 144.61 | 85.10 |

Source: CBS, 1995b

Table A.3.2 National inflation according to expenditure group, 1969-94

| Year | Expenditure group Food | Housing | Cloth | Services | Total |
|---|---|---|---|---|---|
| 1969 | 8.54 | 12.27 | 1.60 | 17.50 | 9.89 |
| 1970 | 1.26 | 48.74 | 18.58 | 11.83 | 8.88 |
| 1971 | 2.23 | 0.97 | 2.62 | 3.64 | 2.47 |
| 1972 | 44.64 | 1.45 | -0.28 | 3.56 | 25.84 |
| 1973 | 28.36 | 14.91 | 31.87 | 26.78 | 27.30 |
| 1974 | 32.18 | 22.76 | 33.19 | 41.29 | 33.32 |
| 1975 | 23.44 | 32.40 | 9.32 | 8.25 | 19.69 |
| 1976 | 13.18 | 23.50 | 11.69 | 15.31 | 14.20 |
| 1977 | 12.43 | 13.08 | 7.28 | 11.13 | 11.82 |
| 1978 | 4.44 | 2.80 | 8.51 | 15.79 | 6.69 |
| 1979 | 22.37 | 17.04 | 29.67 | 18.38 | 21.77 |
| 1980 | 16.25 | 18.28 | 12.70 | 14.62 | 15.97 |
| 1981 | 7.99 | 7.74 | 3.81 | 5.92 | 7.09 |
| 1982 | 7.29 | 14.33 | 3.39 | 11.79 | 9.69 |
| 1983 | 10.04 | 12.91 | 4.31 | 16.29 | 11.46 |
| 1984 | 6.32 | 12.80 | 3.00 | 10.84 | 8.76 |
| 1985 | 2.05 | 7.03 | 3.32 | 5.22 | 4.31 |
| 1986 | 13.59 | 4.58 | 9.47 | 5.77 | 8.83 |
| 1987 | 11.68 | 5.99 | 7.73 | 8.07 | 8.90 |
| 1988 | 7.81 | 4.25 | 3.52 | 3.14 | 5.47 |
| 1989 | 6.66 | 6.13 | 4.71 | 4.26 | 5.97 |
| 1990 | 6.97 | 12.43 | 4.80 | 11.61 | 9.53 |
| 1991 | 9.65 | 7.68 | 5.21 | 13.19 | 9.52 |
| 1992 | 6.01 | 4.56 | 7.23 | 3.39 | 4.94 |
| 1993 | 5.10 | 15.48 | 7.97 | 9.89 | 9.77 |
| 1994 | 13.93 | 9.09 | 6.08 | 4.89 | 9.24 |

Source: CBS, 1995b

Table A.3.3 Percentage of delivery assistance, Indonesia, 1992-94

| Delivery assistance | 1992 | 1993 | 1994 |
|---|---|---|---|
| Doctor | 5.88 | 5.93 | 6.47 |
| Midwives/other medical staff | 32.62 | 33.87 | 37.14 |
| Traditional birth attendance | 58.54 | 57.50 | 53.84 |
| Other | 2.96 | 2.70 | 2.55 |
| Total | 100.00 | 100.00 | 100.00 |

Source: CBS, 1995b

Table A.3.4 Provincial distribution of community health resource, Indonesia, 1987

| Province | Health centers distance (Km) | Health centers doctors per center | Sub centers distance (Km) | Posyandu distance (Km) |
|---|---|---|---|---|
| DI Aceh | 11.27 | 1.04 | 6.27 | 3.9 |
| North Sumatra | 8.75 | 1.04 | 4.79 | 2.0 |
| West Sumatra | 10.21 | 1.03 | 5.71 | 2.0 |
| Riau | 17.09 | 1.03 | 8.82 | 4.8 |
| Jambi | 13.28 | 0.96 | 7.11 | 4.0 |
| South Sumatra | 13.54 | 1.02 | 8.45 | 3.3 |
| Bengkulu | 9.41 | 1.03 | 5.48 | 2.8 |
| Lampung | 8.89 | 0.99 | 5.95 | 1.5 |
| DKI Jakarta | 0.82 | 1.78 | n.a. | 0.2 |
| West Java | 4.66 | 1.00 | 3.95 | 0.8 |
| Central Java | 4.00 | 0.98 | 3.08 | 0.6 |
| DI Yogyakarta | 3.18 | 1.02 | 1.95 | 0.5 |
| East Java | 4.31 | 0.89 | 3.54 | 0.7 |
| Bali | 4.54 | 1.26 | 2.34 | 0.7 |
| West Nusa Tenggara | 8.40 | 1.10 | 4.67 | 1.6 |
| East Nusa Tenggara | 10.95 | 0.50 | 5.98 | 2.9 |
| East Timor | 8.60 | 0.69 | 6.71 | 2.8 |
| West Kalimantan | 17.70 | 0.79 | 9.61 | 6.6 |
| Central Kalimantan | 22.37 | 0.77 | 10.66 | 7.3 |
| South Kalimantan | 8.68 | 0.53 | 5.56 | 3.1 |
| East Kalimantan | 24.20 | 0.74 | 15.36 | 7.7 |
| North Sulawesi | 7.16 | 1.03 | 3.48 | 1.6 |
| Central Sulawesi | 17.43 | 1.01 | 7.15 | 4.7 |
| South Sulawesi | 9.66 | 0.83 | 5.41 | 2.0 |
| Southeast Sulawesi | 11.47 | 0.85 | 6.24 | 2.8 |
| Maluku | 15.32 | 0.67 | 9.25 | 5.0 |
| Irian Jaya | 32.64 | 0.35 | 20.23 | 13.6 |

Source: World Bank, 1991: 50, Table 3.1

Table A.3.5 Provincial distribution of beds per 1000 population and doctors per bed, Indonesia, 1985

| Province | Beds per 100,000 population | | Doctors per bed | |
|---|---|---|---|---|
| | All hospital | MOH hospital | All hospital | MOH hospital |
| DI Aceh | 46 | 29 | 0.08 | 0.08 |
| North Sumatra | 108 | 26 | 0.12 | 0.07 |
| West Sumatra | 61 | 44 | 0.09 | 0.10 |
| Riau | 50 | 24 | 0.08 | 0.08 |
| Jambi | 39 | 24 | 0.07 | 0.08 |
| South Sumatra | 62 | 24 | 0.11 | 0.14 |
| Bengkulu | 31 | 29 | 0.13 | 0.14 |
| Lampung | 18 | 15 | 0.15 | 0.09 |
| DKI Jakarta | 124 | 40 | 0.28 | 0.45 |
| West Java | 26 | 14 | 0.16 | 0.19 |
| Central Java | 43 | 27 | 0.15 | 0.07 |
| DI Yogyakarta | 81 | 35 | 0.19 | 0.35 |
| East Java | 43 | 24 | 0.12 | 0.16 |
| Bali | 70 | 58 | 0.13 | 0.14 |
| West Nusa Tenggara | 22 | 19 | 0.08 | 0.07 |
| East Nusa Tenggara | 47 | 26 | 0.03 | 0.04 |
| East Timor | 70 | 44 | 0.06 | 0.09 |
| West Kalimantan | 45 | 37 | 0.05 | 0.05 |
| Central Kalimantan | 41 | 39 | 0.06 | 0.06 |
| South Kalimantan | 53 | 30 | 0.07 | 0.08 |
| East Kalimantan | 96 | 53 | 0.08 | 0.09 |
| North Sulawesi | 97 | 40 | 0.11 | 0.14 |
| Central Sulawesi | 54 | 42 | 0.05 | 0.06 |
| South Sulawesi | 50 | 29 | 0.11 | 0.11 |
| Southeast Sulawesi | 60 | 32 | 0.06 | 0.04 |
| Maluku | 82 | 39 | 0.04 | 0.05 |
| Irian Jaya | 96 | 68 | 0.04 | 0.03 |

Source: World Bank, 1991: 32, Table 2.3

Table A.4.1 Indirect estimate of infant mortality $q_{(1)}$ using Coale-Demeny West Model, based on the 1980, 1990 Censuses and 1985, 1995 Intercensal Surveys

| Age of ever married women | 1980 Census | | 1985 Intercensal | | 1990 Census | | 1995 Intercensal | |
|---|---|---|---|---|---|---|---|---|
| | Ref. date | IMR | Ref. date | IMR | Ref. date | IMR | Ref. date | IMR |
| 20-24 | 1977.2 | 96 | 1982.1 | 57 | 1986.9 | 60 | 1991.7 | 42 |
| 25-29 | 1975.5 | 106 | 1980.5 | 67 | 1985.4 | 67 | 1990.2 | 48 |
| 30-34 | 1973.9 | 115 | 1978.9 | 78 | 1983.9 | 74 | 1988.8 | 55 |
| 35-39 | 1972.3 | 124 | 1977.3 | 87 | 1982.5 | 82 | 1987.4 | 61 |
| 40-44 | 1970.3 | 133 | 1975.4 | 97 | 1980.8 | 94 | 1985.7 | 65 |
| 45-49 | 1967.6 | 134 | 1972.7 | 103 | 1978.1 | 100 | 1983.1 | 70 |

Calculated from publication of CBS 1982, 1987, 1992c and 1996c

Table A.4.2 Proportion dead, Indonesia, based on the 1980, 1990 Censuses and 1985, 1995 Intercensal Surveys

| Age of ever married women | Census 1980 | Intercensal 1985 | Census 1990 | Intercensal 1995 |
|---|---|---|---|---|
| 15-19 | 0.133 | 0.075 | 0.093 | 0.059 |
| 20-24 | 0.130 | 0.074 | 0.081 | 0.055 |
| 25-29 | 0.145 | 0.087 | 0.087 | 0.059 |
| 30-34 | 0.163 | 0.107 | 0.100 | 0.070 |
| 35-39 | 0.188 | 0.127 | 0.119 | 0.084 |
| 40-44 | 0.217 | 0.154 | 0.147 | 0.097 |
| 45-49 | 0.237 | 0.179 | 0.171 | 0.117 |

Calculated from publication of CBS 1982, 1987, 1992c and 1996c

Table A.4.3 Survival function of children during first year of life according to group of islands in Indonesia, 1984-94

| Age (month) | Sumatra | Java-Bali | Kalimantan | Sulawesi | Eastern Indonesia |
|---|---|---|---|---|---|
| 0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1 | 0.9679 | 0.9735 | 0.9673 | 0.9703 | 0.9718 |
| 2 | 0.9632 | 0.9680 | 0.9578 | 0.9610 | 0.9658 |
| 3 | 0.9594 | 0.9638 | 0.9521 | 0.9569 | 0.9596 |
| 4 | 0.9553 | 0.9599 | 0.9477 | 0.9513 | 0.9543 |
| 5 | 0.9531 | 0.9569 | 0.9444 | 0.9482 | 0.9500 |
| 6 | 0.9514 | 0.9550 | 0.9418 | 0.9451 | 0.9479 |
| 7 | 0.9483 | 0.9520 | 0.9393 | 0.9422 | 0.9455 |
| 8 | 0.9456 | 0.9492 | 0.9352 | 0.9394 | 0.9419 |
| 9 | 0.9432 | 0.9477 | 0.9326 | 0.9360 | 0.9380 |
| 10 | 0.9413 | 0.9461 | 0.9304 | 0.9334 | 0.9347 |
| 11 | 0.9406 | 0.9452 | 0.9295 | 0.9323 | 0.9330 |
| 12 | 0.9398 | 0.9444 | 0.9287 | 0.9312 | 0.9316 |

Source: 1994 IDHS data set

Table A.4.4 Survival function of children during first year of life according to place of residence in Indonesia, 1984-94

| Age (month) | Indonesia urban | Indonesia rural | Indonesia |
|---|---|---|---|
| 0 | 1.0000 | 1.0000 | 1.0000 |
| 1 | 0.9772 | 0.9679 | 0.9702 |
| 2 | 0.9738 | 0.9606 | 0.9639 |
| 3 | 0.9721 | 0.9549 | 0.9592 |
| 4 | 0.9693 | 0.9498 | 0.9547 |
| 5 | 0.9680 | 0.9462 | 0.9517 |
| 6 | 0.9666 | 0.9438 | 0.9496 |
| 7 | 0.9650 | 0.9405 | 0.9467 |
| 8 | 0.9630 | 0.9371 | 0.9436 |
| 9 | 0.9616 | 0.9341 | 0.9410 |
| 10 | 0.9605 | 0.9315 | 0.9388 |
| 11 | 0.9597 | 0.9304 | 0.9378 |
| 12 | 0.9590 | 0.9293 | 0.9368 |

Source: 1994 IDHS data set

Table A.4.5 Survival function of children during first year of life according to provinces in Sumatra island, 1984-194

| Age (month) | Aceh | North Sumatra | West Sumatra | Riau | Jambi | South Sumatra | Beng-kulu | Lam-pung |
|---|---|---|---|---|---|---|---|---|
| 0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1 | 0.9677 | 0.9606 | 0.9738 | 0.9564 | 0.9655 | 0.9756 | 0.9620 | 0.9857 |
| 2 | 0.9617 | 0.9545 | 0.9698 | 0.9519 | 0.9606 | 0.9728 | 0.9586 | 0.9814 |
| 3 | 0.9581 | 0.9526 | 0.9625 | 0.9500 | 0.9556 | 0.9664 | 0.9527 | 0.9807 |
| 4 | 0.9550 | 0.9507 | 0.9601 | 0.9467 | 0.9489 | 0.9572 | 0.9484 | 0.9777 |
| 5 | 0.9532 | 0.9497 | 0.9543 | 0.9454 | 0.9480 | 0.9551 | 0.9450 | 0.9755 |
| 6 | 0.9519 | 0.9473 | 0.9518 | 0.9454 | 0.9480 | 0.9536 | 0.9398 | 0.9740 |
| 7 | 0.9475 | 0.9448 | 0.9477 | 0.9420 | 0.9471 | 0.9500 | 0.9364 | 0.9717 |
| 8 | 0.9438 | 0.9418 | 0.9443 | 0.9373 | 0.9445 | 0.9493 | 0.9346 | 0.9710 |
| 9 | 0.9425 | 0.9398 | 0.9400 | 0.9333 | 0.9419 | 0.9478 | 0.9346 | 0.9671 |
| 10 | 0.9412 | 0.9388 | 0.9392 | 0.9306 | 0.9401 | 0.9433 | 0.9328 | 0.9656 |
| 11 | 0.9412 | 0.9378 | 0.9375 | 0.9306 | 0.9401 | 0.9433 | 0.9328 | 0.9624 |
| 12 | 0.9412 | 0.9368 | 0.9348 | 0.9299 | 0.9392 | 0.9433 | 0.9310 | 0.9624 |

Source: 1994 IDHS data set

Table A.4.6 Survival function of children during first year of life according to provinces in Java-Bali island, 1984-94

| Age (month) | DKI Jakarta | West Java | Central Java | Yogya-karta | East Java | Bali |
|---|---|---|---|---|---|---|
| 0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1 | 0.9836 | 0.9576 | 0.9753 | 0.9850 | 0.9691 | 0.9780 |
| 2 | 0.9820 | 0.9486 | 0.9724 | 0.9820 | 0.9638 | 0.9673 |
| 3 | 0.9814 | 0.9395 | 0.9665 | 0.9810 | 0.9600 | 0.9649 |
| 4 | 0.9782 | 0.9337 | 0.9624 | 0.9769 | 0.9553 | 0.9649 |
| 5 | 0.9771 | 0.9288 | 0.9595 | 0.9739 | 0.9530 | 0.9615 |
| 6 | 0.9754 | 0.9249 | 0.9595 | 0.9718 | 0.9506 | 0.9606 |
| 7 | 0.9732 | 0.9205 | 0.9547 | 0.9718 | 0.9482 | 0.9580 |
| 8 | 0.9715 | 0.9170 | 0.9529 | 0.9708 | 0.9426 | 0.9546 |
| 9 | 0.9715 | 0.9160 | 0.9510 | 0.9697 | 0.9393 | 0.9520 |
| 10 | 0.9710 | 0.9115 | 0.9492 | 0.9697 | 0.9393 | 0.9511 |
| 11 | 0.9710 | 0.9104 | 0.9486 | 0.9697 | 0.9377 | 0.9493 |
| 12 | 0.9698 | 0.9104 | 0.9473 | 0.9686 | 0.9369 | 0.9484 |

Source: 1994 IDHS data set

Table A.4.7 Survival function of children during first year of life according to provinces in Kalimantan island, 1984-94

| Age (month) | West Kalimantan | Central Kalimantan | South Kalimantan | East Kalimantan |
|---|---|---|---|---|
| 0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1 | 0.9554 | 0.9913 | 0.9610 | 0.9688 |
| 2 | 0.9382 | 0.9903 | 0.9514 | 0.9633 |
| 3 | 0.9320 | 0.9874 | 0.9453 | 0.9558 |
| 4 | 0.9263 | 0.9864 | 0.9400 | 0.9511 |
| 5 | 0.9238 | 0.9854 | 0.9329 | 0.9483 |
| 6 | 0.9200 | 0.9854 | 0.9294 | 0.9463 |
| 7 | 0.9174 | 0.9834 | 0.9267 | 0.9434 |
| 8 | 0.9122 | 0.9814 | 0.9239 | 0.9376 |
| 9 | 0.9083 | 0.9804 | 0.9212 | 0.9356 |
| 10 | 0.9037 | 0.9804 | 0.9194 | 0.9346 |
| 11 | 0.9023 | 0.9804 | 0.9184 | 0.9336 |
| 12 | 0.9010 | 0.9794 | 0.9175 | 0.9336 |

Source: 1994 IDHS data set

Table A.4.8 Survival function of children during first year of life according to provinces in Sulawesi island, 1984-94

| Age (month) | North Sulawesi | Central Sulawesi | South Sulawesi | South East Sulawesi |
|---|---|---|---|---|
| 0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1 | 0.9795 | 0.9673 | 0.9655 | 0.9724 |
| 2 | 0.9723 | 0.9584 | 0.9578 | 0.9585 |
| 3 | 0.9723 | 0.9486 | 0.9554 | 0.9542 |
| 4 | 0.9661 | 0.9423 | 0.9494 | 0.9506 |
| 5 | 0.9598 | 0.9386 | 0.9470 | 0.9497 |
| 6 | 0.9577 | 0.9359 | 0.9452 | 0.9435 |
| 7 | 0.9545 | 0.9331 | 0.9427 | 0.9398 |
| 8 | 0.9513 | 0.9293 | 0.9409 | 0.9371 |
| 9 | 0.9426 | 0.9265 | 0.9390 | 0.9352 |
| 10 | 0.9393 | 0.9217 | 0.9390 | 0.9315 |
| 11 | 0.9393 | 0.9188 | 0.9377 | 0.9315 |
| 12 | 0.9382 | 0.9169 | 0.9365 | 0.9315 |

Source: 1994 IDHS data set

Table A.4.9 Survival function of children during first year of life according to provinces in Eastern Indonesia island, 1984-94

| Age (month) | West Nusa Tenggara. | East Nusa Tenggara. | East Timor | Maluku | Irian Jaya |
|---|---|---|---|---|---|
| 0 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 1 | 0.9542 | 0.9705 | 0.9835 | 0.9755 | 0.9725 |
| 2 | 0.9456 | 0.9632 | 0.9790 | 0.9695 | 0.9682 |
| 3 | 0.9316 | 0.9588 | 0.9749 | 0.9642 | 0.9657 |
| 4 | 0.9215 | 0.9566 | 0.9718 | 0.9596 | 0.9581 |
| 5 | 0.9167 | 0.9529 | 0.9698 | 0.9527 | 0.9529 |
| 6 | 0.9133 | 0.9514 | 0.9682 | 0.9503 | 0.9512 |
| 7 | 0.9077 | 0.9483 | 0.9666 | 0.9487 | 0.9512 |
| 8 | 0.9035 | 0.9453 | 0.9618 | 0.9472 | 0.9477 |
| 9 | 0.8986 | 0.9383 | 0.9585 | 0.9447 | 0.9459 |
| 10 | 0.8986 | 0.9344 | 0.9552 | 0.9382 | 0.9424 |
| 11 | 0.8958 | 0.9312 | 0.9541 | 0.9382 | 0.9415 |
| 12 | 0.8951 | 0.9304 | 0.9525 | 0.9349 | 0.9406 |

Source: 1994 IDHS data set

## Table A.5.1 Life table for infant survival, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH for Indonesia

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 38628.0 | 166.0 | 38545.0 | 1148.0 | .0298 | .9702 | .9702 | .0298 | .0302 | .0009 | .0009 | .0009 |
| 1.0 | 37314.0 | 326.0 | 37151.0 | 242.0 | .0065 | .9935 | .9639 | .0063 | .0065 | .0010 | .0004 | .0004 |
| 2.0 | 36746.0 | 305.0 | 36593.5 | 177.0 | .0048 | .9952 | .9592 | .0047 | .0048 | .0010 | .0003 | .0004 |
| 3.0 | 36264.0 | 302.0 | 36113.0 | 169.0 | .0047 | .9953 | .9547 | .0045 | .0047 | .0011 | .0003 | .0004 |
| 4.0 | 35793.0 | 299.0 | 35643.5 | 114.0 | .0032 | .9968 | .9517 | .0031 | .0032 | .0011 | .0003 | .0003 |
| 5.0 | 35380.0 | 253.0 | 35253.5 | 79.0 | .0022 | .9978 | .9496 | .0021 | .0022 | .0011 | .0002 | .0003 |
| 6.0 | 35048.0 | 283.0 | 34906.5 | 105.0 | .0030 | .9970 | .9467 | .0029 | .0030 | .0012 | .0003 | .0003 |
| 7.0 | 34660.0 | 327.0 | 34496.5 | 112.0 | .0032 | .9968 | .9436 | .0031 | .0033 | .0012 | .0003 | .0003 |
| 8.0 | 34221.0 | 299.0 | 34071.5 | 95.0 | .0028 | .9972 | .9410 | .0026 | .0028 | .0012 | .0003 | .0003 |
| 9.0 | 33827.0 | 273.0 | 33690.5 | 80.0 | .0024 | .9976 | .9388 | .0022 | .0024 | .0012 | .0002 | .0003 |
| 10.0 | 33474.0 | 283.0 | 33332.5 | 35.0 | .0011 | .9989 | .9378 | .0010 | .0011 | .0012 | .0002 | .0002 |
| 11.0 | 33156.0 | 273.0 | 33019.5 | 35.0 | .0011 | .9989 | .9368 | .0010 | .0011 | .0013 | .0002 | .0002 |
| 12.0 | 32848.0 | 3241.0 | 31227.5 | 356.0 | .0114 | .9886 | .9261 | .0009 | .0010 | .0014 | .0000 | .0001 |
| 24.0 | 29251.0 | 3507.0 | 27497.5 | 223.0 | .0081 | .9919 | .9186 | .0006 | .0007 | .0014 | .0000 | .0000 |
| 36.0 | 25521.0 | 3444.0 | 23799.0 | 130.0 | .0055 | .9945 | .9136 | .0004 | .0005 | .0015 | .0000 | .0000 |
| 48.0 | 21947.0 | 3416.0 | 20239.0 | 60.0 | .0030 | .9970 | .9109 | .0002 | .0002 | .0015 | .0000 | .0000 |
| 60.0+ | 18471.0 | 18471.0 | 9235.5 | .0 | .0000 | 1.0000 | .9109 | ** | ** | .0015 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.2 Life table for infant survival for sex of the child = male, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q214 Sex of child = 1 Male

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 19927.0 | 73.0 | 19890.5 | 679.0 | .0341 | .9659 | .9659 | .0341 | .0347 | .0013 | .0013 | .0013 |
| 1.0 | 19175.0 | 158.0 | 19096.0 | 136.0 | .0071 | .9929 | .9590 | .0069 | .0071 | .0014 | .0006 | .0006 |
| 2.0 | 18881.0 | 179.0 | 18791.5 | 105.0 | .0056 | .9944 | .9536 | .0054 | .0056 | .0015 | .0005 | .0005 |
| 3.0 | 18597.0 | 155.0 | 18519.5 | 95.0 | .0051 | .9949 | .9487 | .0049 | .0051 | .0016 | .0005 | .0005 |
| 4.0 | 18347.0 | 147.0 | 18273.5 | 59.0 | .0032 | .9968 | .9457 | .0031 | .0032 | .0016 | .0004 | .0004 |
| 5.0 | 18141.0 | 125.0 | 18078.5 | 43.0 | .0024 | .9976 | .9434 | .0022 | .0024 | .0016 | .0003 | .0004 |
| 6.0 | 17973.0 | 158.0 | 17894.0 | 50.0 | .0028 | .9972 | .9408 | .0026 | .0028 | .0017 | .0004 | .0004 |
| 7.0 | 17765.0 | 177.0 | 17676.5 | 66.0 | .0037 | .9963 | .9373 | .0035 | .0037 | .0017 | .0004 | .0005 |
| 8.0 | 17522.0 | 166.0 | 17439.0 | 57.0 | .0033 | .9967 | .9342 | .0031 | .0033 | .0018 | .0004 | .0004 |
| 9.0 | 17299.0 | 145.0 | 17226.5 | 48.0 | .0028 | .9972 | .9316 | .0026 | .0028 | .0018 | .0004 | .0004 |
| 10.0 | 17106.0 | 135.0 | 17038.5 | 19.0 | .0011 | .9989 | .9306 | .0010 | .0011 | .0018 | .0002 | .0003 |
| 11.0 | 16952.0 | 142.0 | 16881.0 | 15.0 | .0009 | .9991 | .9297 | .0008 | .0009 | .0018 | .0002 | .0002 |
| 12.0 | 16795.0 | 1607.0 | 15991.5 | 192.0 | .0120 | .9880 | .9186 | .0009 | .0010 | .0020 | .0001 | .0001 |
| 24.0 | 14996.0 | 1752.0 | 14120.0 | 113.0 | .0080 | .9920 | .9112 | .0006 | .0007 | .0021 | .0001 | .0001 |
| 36.0 | 13131.0 | 1819.0 | 12221.5 | 72.0 | .0059 | .9941 | .9059 | .0004 | .0005 | .0022 | .0001 | .0001 |
| 48.0 | 11240.0 | 1723.0 | 10378.5 | 27.0 | .0026 | .9974 | .9035 | .0002 | .0002 | .0022 | .0000 | .0000 |
| 60.0+ | 9490.0 | 9490.0 | 4745.0 | .0 | .0000 | 1.0000 | .9035 | ** | ** | .0022 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.3 Life table for infant survival for sex of the child = female, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q214 Sex of child = 2 Female

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 18701.0 | 93.0 | 18654.5 | 469.0 | .0251 | .9749 | .9749 | .0251 | .0255 | .0011 | .0011 | .0012 |
| 1.0 | 18139.0 | 168.0 | 18055.0 | 106.0 | .0059 | .9941 | .9691 | .0057 | .0059 | .0013 | .0006 | .0006 |
| 2.0 | 17865.0 | 126.0 | 17802.0 | 72.0 | .0040 | .9960 | .9652 | .0039 | .0041 | .0013 | .0005 | .0005 |
| 3.0 | 17667.0 | 147.0 | 17593.5 | 74.0 | .0042 | .9958 | .9612 | .0041 | .0042 | .0014 | .0005 | .0005 |
| 4.0 | 17446.0 | 152.0 | 17370.0 | 55.0 | .0032 | .9968 | .9581 | .0030 | .0032 | .0015 | .0004 | .0004 |
| 5.0 | 17239.0 | 128.0 | 17175.0 | 36.0 | .0021 | .9979 | .9561 | .0020 | .0021 | .0015 | .0003 | .0003 |
| 6.0 | 17075.0 | 125.0 | 17012.5 | 55.0 | .0032 | .9968 | .9530 | .0031 | .0032 | .0016 | .0004 | .0004 |
| 7.0 | 16895.0 | 150.0 | 16820.0 | 46.0 | .0027 | .9973 | .9504 | .0026 | .0027 | .0016 | .0004 | .0004 |
| 8.0 | 16699.0 | 133.0 | 16632.5 | 38.0 | .0023 | .9977 | .9482 | .0022 | .0023 | .0016 | .0004 | .0004 |
| 9.0 | 16528.0 | 128.0 | 16464.0 | 32.0 | .0019 | .9981 | .9464 | .0018 | .0019 | .0017 | .0003 | .0003 |
| 10.0 | 16368.0 | 148.0 | 16294.0 | 16.0 | .0010 | .9990 | .9455 | .0009 | .0010 | .0017 | .0002 | .0002 |
| 11.0 | 16204.0 | 131.0 | 16138.5 | 20.0 | .0012 | .9988 | .9443 | .0012 | .0012 | .0017 | .0003 | .0003 |
| 12.0 | 16053.0 | 1634.0 | 15236.0 | 164.0 | .0108 | .9892 | .9341 | .0008 | .0009 | .0019 | .0001 | .0001 |
| 24.0 | 14255.0 | 1755.0 | 13377.5 | 110.0 | .0082 | .9918 | .9264 | .0006 | .0007 | .0020 | .0001 | .0001 |
| 36.0 | 12390.0 | 1625.0 | 11577.5 | 58.0 | .0050 | .9950 | .9218 | .0004 | .0004 | .0021 | .0001 | .0001 |
| 48.0 | 10707.0 | 1693.0 | 9860.5 | 33.0 | .0033 | .9967 | .9187 | .0003 | .0003 | .0021 | .0000 | .0000 |
| 60.0+ | 8981.0 | 8981.0 | 4490.5 | .0 | .0000 | 1.0000 | .9187 | ** | ** | .0021 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.4 Life table for infant survival for birth cohort = 0-5 years before the survey, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for COHORT = 1 0-5 years before
sur

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 18515.0 | 166.0 | 18432.0 | 509.0 | .0276 | .9724 | .9724 | .0276 | .0280 | .0012 | .0012 | .0012 |
| 1.0 | 17840.0 | 326.0 | 17677.0 | 106.0 | .0060 | .9940 | .9666 | .0058 | .0060 | .0013 | .0006 | .0006 |
| 2.0 | 17408.0 | 305.0 | 17255.5 | 72.0 | .0042 | .9958 | .9625 | .0040 | .0042 | .0014 | .0005 | .0005 |
| 3.0 | 17031.0 | 302.0 | 16880.0 | 72.0 | .0043 | .9957 | .9584 | .0041 | .0043 | .0015 | .0005 | .0005 |
| 4.0 | 16657.0 | 299.0 | 16507.5 | 43.0 | .0026 | .9974 | .9559 | .0025 | .0026 | .0015 | .0004 | .0004 |
| 5.0 | 16315.0 | 253.0 | 16188.5 | 30.0 | .0019 | .9981 | .9541 | .0018 | .0019 | .0016 | .0003 | .0003 |
| 6.0 | 16032.0 | 283.0 | 15890.5 | 43.0 | .0027 | .9973 | .9516 | .0026 | .0027 | .0016 | .0004 | .0004 |
| 7.0 | 15706.0 | 327.0 | 15542.5 | 43.0 | .0028 | .9972 | .9489 | .0026 | .0028 | .0016 | .0004 | .0004 |
| 8.0 | 15336.0 | 299.0 | 15186.5 | 35.0 | .0023 | .9977 | .9467 | .0022 | .0023 | .0017 | .0004 | .0004 |
| 9.0 | 15002.0 | 273.0 | 14865.5 | 23.0 | .0015 | .9985 | .9453 | .0015 | .0015 | .0017 | .0003 | .0003 |
| 10.0 | 14706.0 | 283.0 | 14564.5 | 15.0 | .0010 | .9990 | .9443 | .0010 | .0010 | .0017 | .0003 | .0003 |
| 11.0 | 14408.0 | 273.0 | 14271.5 | 16.0 | .0011 | .9989 | .9432 | .0011 | .0011 | .0017 | .0003 | .0003 |
| 12.0 | 14119.0 | 3241.0 | 12498.5 | 130.0 | .0104 | .9896 | .9334 | .0008 | .0009 | .0019 | .0001 | .0001 |
| 24.0 | 10748.0 | 3507.0 | 8994.5 | 61.0 | .0068 | .9932 | .9271 | .0005 | .0006 | .0021 | .0001 | .0001 |
| 36.0 | 7180.0 | 3444.0 | 5458.0 | 23.0 | .0042 | .9958 | .9232 | .0003 | .0004 | .0022 | .0001 | .0001 |
| 48.0 | 3713.0 | 3416.0 | 2005.0 | 10.0 | .0050 | .9950 | .9186 | .0004 | .0004 | .0026 | .0001 | .0001 |
| 60.0+ | 287.0 | 287.0 | 143.5 | .0 | .0000 | 1.0000 | .9186 | ** | ** | .0026 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.5 Life table for infant survival for birth cohort = 5-10 years before the survey, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for COHORT = 2 5-10 years before
su

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi- nating | Propn Sur- viving | Cumul Propn Surv at End | Proba- bility Densty | Hazard Rate | SE of Cumul Sur- viving | SE of Proba- bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 20113.0 | .0 | 20113.0 | 639.0 | .0318 | .9682 | .9682 | .0318 | .0323 | .0012 | .0012 | .0013 |
| 1.0 | 19474.0 | .0 | 19474.0 | 136.0 | .0070 | .9930 | .9615 | .0068 | .0070 | .0014 | .0006 | .0006 |
| 2.0 | 19338.0 | .0 | 19338.0 | 105.0 | .0054 | .9946 | .9562 | .0052 | .0054 | .0014 | .0005 | .0005 |
| 3.0 | 19233.0 | .0 | 19233.0 | 97.0 | .0050 | .9950 | .9514 | .0048 | .0051 | .0015 | .0005 | .0005 |
| 4.0 | 19136.0 | .0 | 19136.0 | 71.0 | .0037 | .9963 | .9479 | .0035 | .0037 | .0016 | .0004 | .0004 |
| 5.0 | 19065.0 | .0 | 19065.0 | 49.0 | .0026 | .9974 | .9455 | .0024 | .0026 | .0016 | .0003 | .0004 |
| 6.0 | 19016.0 | .0 | 19016.0 | 62.0 | .0033 | .9967 | .9424 | .0031 | .0033 | .0016 | .0004 | .0004 |
| 7.0 | 18954.0 | .0 | 18954.0 | 69.0 | .0036 | .9964 | .9389 | .0034 | .0036 | .0017 | .0004 | .0004 |
| 8.0 | 18885.0 | .0 | 18885.0 | 60.0 | .0032 | .9968 | .9360 | .0030 | .0032 | .0017 | .0004 | .0004 |
| 9.0 | 18825.0 | .0 | 18825.0 | 57.0 | .0030 | .9970 | .9331 | .0028 | .0030 | .0018 | .0004 | .0004 |
| 10.0 | 18768.0 | .0 | 18768.0 | 20.0 | .0011 | .9989 | .9321 | .0010 | .0011 | .0018 | .0002 | .0002 |
| 11.0 | 18748.0 | .0 | 18748.0 | 19.0 | .0010 | .9990 | .9312 | .0009 | .0010 | .0018 | .0002 | .0002 |
| 12.0 | 18729.0 | .0 | 18729.0 | 226.0 | .0121 | .9879 | .9200 | .0009 | .0010 | .0019 | .0001 | .0001 |
| 24.0 | 18503.0 | .0 | 18503.0 | 162.0 | .0088 | .9912 | .9119 | .0007 | .0007 | .0020 | .0001 | .0001 |
| 36.0 | 18341.0 | .0 | 18341.0 | 107.0 | .0058 | .9942 | .9066 | .0004 | .0005 | .0021 | .0000 | .0000 |
| 48.0 | 18234.0 | .0 | 18234.0 | 50.0 | .0027 | .9973 | .9041 | .0002 | .0002 | .0021 | .0000 | .0000 |
| 60.0+ | 18184.0 | 18184.0 | 9092.0 | .0 | .0000 | 1.0000 | .9041 | ** | ** | .0021 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.6 Life table for infant survival for birth cohort = 10-15 years before the survey, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for COHORT = 3 10-15 years before
s

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi- nating | Propn Sur- viving | Cumul Propn Surv at End | Proba- bility Densty | Hazard Rate | SE of Cumul Sur- viving | SE of Proba- bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 20500.0 | .0 | 20500.0 | 728.0 | .0355 | .9645 | .9645 | .0355 | .0362 | .0013 | .0013 | .0013 |
| 1.0 | 19772.0 | .0 | 19772.0 | 151.0 | .0076 | .9924 | .9571 | .0074 | .0077 | .0014 | .0006 | .0006 |
| 2.0 | 19621.0 | .0 | 19621.0 | 119.0 | .0061 | .9939 | .9513 | .0058 | .0061 | .0015 | .0005 | .0006 |
| 3.0 | 19502.0 | .0 | 19502.0 | 114.0 | .0058 | .9942 | .9458 | .0056 | .0059 | .0016 | .0005 | .0005 |
| 4.0 | 19388.0 | .0 | 19388.0 | 76.0 | .0039 | .9961 | .9420 | .0037 | .0039 | .0016 | .0004 | .0005 |
| 5.0 | 19312.0 | .0 | 19312.0 | 72.0 | .0037 | .9963 | .9385 | .0035 | .0037 | .0017 | .0004 | .0004 |
| 6.0 | 19240.0 | .0 | 19240.0 | 59.0 | .0031 | .9969 | .9357 | .0029 | .0031 | .0017 | .0004 | .0004 |
| 7.0 | 19181.0 | .0 | 19181.0 | 67.0 | .0035 | .9965 | .9324 | .0033 | .0035 | .0018 | .0004 | .0004 |
| 8.0 | 19114.0 | .0 | 19114.0 | 61.0 | .0032 | .9968 | .9294 | .0030 | .0032 | .0018 | .0004 | .0004 |
| 9.0 | 19053.0 | .0 | 19053.0 | 54.0 | .0028 | .9972 | .9268 | .0026 | .0028 | .0018 | .0004 | .0004 |
| 10.0 | 18999.0 | .0 | 18999.0 | 28.0 | .0015 | .9985 | .9254 | .0014 | .0015 | .0018 | .0003 | .0003 |
| 11.0 | 18971.0 | .0 | 18971.0 | 28.0 | .0015 | .9985 | .9240 | .0014 | .0015 | .0019 | .0003 | .0003 |
| 12.0 | 18943.0 | .0 | 18943.0 | 262.0 | .0138 | .9862 | .9113 | .0011 | .0012 | .0020 | .0001 | .0001 |
| 24.0 | 18681.0 | .0 | 18681.0 | 219.0 | .0117 | .9883 | .9006 | .0009 | .0010 | .0021 | .0001 | .0001 |
| 36.0 | 18462.0 | .0 | 18462.0 | 134.0 | .0073 | .9927 | .8940 | .0005 | .0006 | .0021 | .0000 | .0001 |
| 48.0 | 18328.0 | .0 | 18328.0 | 63.0 | .0034 | .9966 | .8910 | .0003 | .0003 | .0022 | .0000 | .0000 |
| 60.0+ | 18265.0 | 18265.0 | 9132.5 | .0 | .0000 | 1.0000 | .8910 | ** | ** | .0022 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.7 Life table for infant survival for preceding birth interval = <19 months and survival status of previous child = alive, Indonesia, 1994 IDHS

```
Life Table
   Survival Variable  AGEDEATH
                for   SPACE      Preceding interval                    =      2  <19 months
                and   Q216P      Previous Child is still alive         =      1  alive
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Terminating | Propn Surviving | Cumul Propn Surv at End | Probability Densty | Hazard Rate | SE of Cumul Surviving | SE of Probability Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 2893.0 | 5.0 | 2890.5 | 124.0 | .0429 | .9571 | .9571 | .0429 | .0438 | .0038 | .0038 | .0039 |
| 1.0 | 2764.0 | 8.0 | 2760.0 | 28.0 | .0101 | .9899 | .9474 | .0097 | .0102 | .0042 | .0018 | .0019 |
| 2.0 | 2728.0 | 19.0 | 2718.5 | 27.0 | .0099 | .9901 | .9380 | .0094 | .0100 | .0045 | .0018 | .0019 |
| 3.0 | 2682.0 | 13.0 | 2675.5 | 18.0 | .0067 | .9933 | .9317 | .0063 | .0068 | .0047 | .0015 | .0016 |
| 4.0 | 2651.0 | 15.0 | 2643.5 | 16.0 | .0061 | .9939 | .9260 | .0056 | .0061 | .0049 | .0014 | .0015 |
| 5.0 | 2620.0 | 12.0 | 2614.0 | 10.0 | .0038 | .9962 | .9225 | .0035 | .0038 | .0050 | .0011 | .0012 |
| 6.0 | 2598.0 | 17.0 | 2589.5 | 23.0 | .0089 | .9911 | .9143 | .0082 | .0089 | .0052 | .0017 | .0019 |
| 7.0 | 2558.0 | 18.0 | 2549.0 | 12.0 | .0047 | .9953 | .9100 | .0043 | .0047 | .0053 | .0012 | .0014 |
| 8.0 | 2528.0 | 12.0 | 2522.0 | 8.0 | .0032 | .9968 | .9071 | .0029 | .0032 | .0054 | .0010 | .0011 |
| 9.0 | 2508.0 | 13.0 | 2501.5 | 5.0 | .0020 | .9980 | .9053 | .0018 | .0020 | .0055 | .0008 | .0009 |
| 10.0 | 2490.0 | 8.0 | 2486.0 | 3.0 | .0012 | .9988 | .9042 | .0011 | .0012 | .0055 | .0006 | .0007 |
| 11.0 | 2479.0 | 17.0 | 2470.5 | 4.0 | .0016 | .9984 | .9027 | .0015 | .0016 | .0055 | .0007 | .0008 |
| 12.0 | 2458.0 | 156.0 | 2380.0 | 49.0 | .0206 | .9794 | .8841 | .0015 | .0017 | .0060 | .0002 | .0002 |
| 24.0 | 2253.0 | 169.0 | 2168.5 | 26.0 | .0120 | .9880 | .8735 | .0009 | .0010 | .0063 | .0002 | .0002 |
| 36.0 | 2058.0 | 209.0 | 1953.5 | 18.0 | .0092 | .9908 | .8655 | .0007 | .0008 | .0065 | .0002 | .0002 |
| 48.0 | 1831.0 | 205.0 | 1728.5 | 11.0 | .0064 | .9936 | .8600 | .0005 | .0005 | .0067 | .0001 | .0002 |
| 60.0+ | 1615.0 | 1615.0 | 807.5 | .0 | .0000 | 1.0000 | .8600 | ** | ** | .0067 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.8 Life table for infant survival for preceding birth interval = 19-36 months and survival status of previous child = alive, Indonesia, 1994 IDHS

```
Life Table
   Survival Variable  AGEDEATH
                for   SPACE      Preceding interval                    =      3  19-36 months
                and   Q216P      Previous Child is still alive         =      1  alive
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Terminating | Propn Surviving | Cumul Propn Surv at End | Probability Densty | Hazard Rate | SE of Cumul Surviving | SE of Probability Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 10653.0 | 47.0 | 10629.5 | 269.0 | .0253 | .9747 | .9747 | .0253 | .0256 | .0015 | .0015 | .0016 |
| 1.0 | 10337.0 | 77.0 | 10298.5 | 59.0 | .0057 | .9943 | .9691 | .0056 | .0057 | .0017 | .0007 | .0007 |
| 2.0 | 10201.0 | 69.0 | 10166.5 | 34.0 | .0033 | .9967 | .9659 | .0032 | .0033 | .0018 | .0006 | .0006 |
| 3.0 | 10098.0 | 74.0 | 10061.0 | 46.0 | .0046 | .9954 | .9615 | .0044 | .0046 | .0019 | .0006 | .0007 |
| 4.0 | 9978.0 | 72.0 | 9942.0 | 29.0 | .0029 | .9971 | .9586 | .0028 | .0029 | .0019 | .0005 | .0005 |
| 5.0 | 9877.0 | 53.0 | 9850.5 | 18.0 | .0018 | .9982 | .9569 | .0018 | .0018 | .0020 | .0004 | .0004 |
| 6.0 | 9806.0 | 65.0 | 9773.5 | 39.0 | .0040 | .9960 | .9531 | .0038 | .0040 | .0021 | .0006 | .0006 |
| 7.0 | 9702.0 | 70.0 | 9667.0 | 27.0 | .0028 | .9972 | .9504 | .0027 | .0028 | .0021 | .0005 | .0005 |
| 8.0 | 9605.0 | 68.0 | 9571.0 | 27.0 | .0028 | .9972 | .9477 | .0027 | .0028 | .0022 | .0005 | .0005 |
| 9.0 | 9510.0 | 62.0 | 9479.0 | 18.0 | .0019 | .9981 | .9459 | .0018 | .0019 | .0022 | .0004 | .0004 |
| 10.0 | 9430.0 | 65.0 | 9397.5 | 15.0 | .0016 | .9984 | .9444 | .0015 | .0016 | .0022 | .0004 | .0004 |
| 11.0 | 9350.0 | 62.0 | 9319.0 | 6.0 | .0006 | .9994 | .9438 | .0006 | .0006 | .0023 | .0002 | .0003 |
| 12.0 | 9282.0 | 800.0 | 8882.0 | 110.0 | .0124 | .9876 | .9321 | .0010 | .0010 | .0025 | .0001 | .0001 |
| 24.0 | 8372.0 | 828.0 | 7958.0 | 69.0 | .0087 | .9913 | .9240 | .0007 | .0007 | .0026 | .0001 | .0001 |
| 36.0 | 7475.0 | 845.0 | 7052.5 | 44.0 | .0062 | .9938 | .9183 | .0005 | .0005 | .0028 | .0001 | .0001 |
| 48.0 | 6586.0 | 941.0 | 6115.5 | 17.0 | .0028 | .9972 | .9157 | .0002 | .0002 | .0028 | .0001 | .0001 |
| 60.0+ | 5628.0 | 5628.0 | 2814.0 | .0 | .0000 | 1.0000 | .9157 | ** | ** | .0028 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.9 Life table for infant survival for preceding birth interval = 37+ months and survival status of previous child = alive, Indonesia, 1994 IDHS

```
Life Table
  Survival Variable  AGEDEATH
                for  SPACE      Preceding interval                    =     4  37+
                and  Q216P      Previous Child is still alive         =     1  alive
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 11784.0 | 68.0 | 11750.0 | 230.0 | .0196 | .9804 | .9804 | .0196 | .0198 | .0013 | .0013 | .0013 |
| 1.0 | 11486.0 | 131.0 | 11420.5 | 49.0 | .0043 | .9957 | .9762 | .0042 | .0043 | .0014 | .0006 | .0006 |
| 2.0 | 11306.0 | 122.0 | 11245.0 | 25.0 | .0022 | .9978 | .9740 | .0022 | .0022 | .0015 | .0004 | .0004 |
| 3.0 | 11159.0 | 123.0 | 11097.5 | 32.0 | .0029 | .9971 | .9712 | .0028 | .0029 | .0015 | .0005 | .0005 |
| 4.0 | 11004.0 | 116.0 | 10946.0 | 23.0 | .0021 | .9979 | .9692 | .0020 | .0021 | .0016 | .0004 | .0004 |
| 5.0 | 10865.0 | 94.0 | 10818.0 | 18.0 | .0017 | .9983 | .9676 | .0016 | .0017 | .0016 | .0004 | .0004 |
| 6.0 | 10753.0 | 105.0 | 10700.5 | 17.0 | .0016 | .9984 | .9660 | .0015 | .0016 | .0017 | .0004 | .0004 |
| 7.0 | 10631.0 | 109.0 | 10576.5 | 23.0 | .0022 | .9978 | .9639 | .0021 | .0022 | .0017 | .0004 | .0005 |
| 8.0 | 10499.0 | 123.0 | 10437.5 | 19.0 | .0018 | .9982 | .9622 | .0018 | .0018 | .0018 | .0004 | .0004 |
| 9.0 | 10357.0 | 104.0 | 10305.0 | 15.0 | .0015 | .9985 | .9608 | .0014 | .0015 | .0018 | .0004 | .0004 |
| 10.0 | 10238.0 | 104.0 | 10186.0 | 4.0 | .0004 | .9996 | .9604 | .0004 | .0004 | .0018 | .0002 | .0002 |
| 11.0 | 10130.0 | 102.0 | 10079.0 | 8.0 | .0008 | .9992 | .9597 | .0008 | .0008 | .0018 | .0003 | .0003 |
| 12.0 | 10020.0 | 1176.0 | 9432.0 | 61.0 | .0065 | .9935 | .9534 | .0005 | .0005 | .0020 | .0001 | .0001 |
| 24.0 | 8783.0 | 1284.0 | 8141.0 | 37.0 | .0045 | .9955 | .9491 | .0004 | .0004 | .0021 | .0001 | .0001 |
| 36.0 | 7462.0 | 1205.0 | 6859.5 | 27.0 | .0039 | .9961 | .9454 | .0003 | .0003 | .0022 | .0001 | .0001 |
| 48.0 | 6230.0 | 1114.0 | 5673.0 | 11.0 | .0019 | .9981 | .9435 | .0002 | .0002 | .0023 | .0000 | .0000 |
| 60.0+ | 5105.0 | 5105.0 | 2552.5 | .0 | .0000 | 1.0000 | .9435 | ** | ** | .0023 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.10 Life table for infant survival for preceding birth interval = <19 months and survival status of previous child = death Indonesia, 1994 IDHS

```
Life Table
  Survival Variable  AGEDEATH
                for  SPACE      Preceding interval                    =     2  <19 months
                and  Q216P      Previous Child is still alive         =     2  prev. birth death
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1007.0 | 4.0 | 1005.0 | 119.0 | .1184 | .8816 | .8816 | .1184 | .1259 | .0102 | .0102 | .0115 |
| 1.0 | 884.0 | 1.0 | 883.5 | 30.0 | .0340 | .9660 | .8517 | .0299 | .0345 | .0112 | .0054 | .0063 |
| 2.0 | 853.0 | 4.0 | 851.0 | 19.0 | .0223 | .9777 | .8326 | .0190 | .0226 | .0118 | .0043 | .0052 |
| 3.0 | 830.0 | 4.0 | 828.0 | 19.0 | .0229 | .9771 | .8135 | .0191 | .0232 | .0123 | .0043 | .0053 |
| 4.0 | 807.0 | 2.0 | 806.0 | 9.0 | .0112 | .9888 | .8045 | .0091 | .0112 | .0125 | .0030 | .0037 |
| 5.0 | 796.0 | 3.0 | 794.5 | 6.0 | .0076 | .9924 | .7984 | .0061 | .0076 | .0127 | .0025 | .0031 |
| 6.0 | 787.0 | 7.0 | 783.5 | 6.0 | .0077 | .9923 | .7923 | .0061 | .0077 | .0128 | .0025 | .0031 |
| 7.0 | 774.0 | 6.0 | 771.0 | 5.0 | .0065 | .9935 | .7871 | .0051 | .0065 | .0129 | .0023 | .0029 |
| 8.0 | 763.0 | 5.0 | 760.5 | 7.0 | .0092 | .9908 | .7799 | .0072 | .0092 | .0131 | .0027 | .0035 |
| 9.0 | 751.0 | 3.0 | 749.5 | 1.0 | .0013 | .9987 | .7788 | .0010 | .0013 | .0131 | .0010 | .0013 |
| 10.0 | 747.0 | 5.0 | 744.5 | 2.0 | .0027 | .9973 | .7767 | .0021 | .0027 | .0132 | .0015 | .0019 |
| 11.0 | 740.0 | 7.0 | 736.5 | 6.0 | .0081 | .9919 | .7704 | .0063 | .0082 | .0133 | .0026 | .0033 |
| 12.0 | 727.0 | 44.0 | 705.0 | 24.0 | .0340 | .9660 | .7442 | .0022 | .0029 | .0139 | .0004 | .0006 |
| 24.0 | 659.0 | 48.0 | 635.0 | 21.0 | .0331 | .9669 | .7196 | .0021 | .0028 | .0144 | .0004 | .0006 |
| 36.0 | 590.0 | 61.0 | 559.5 | 7.0 | .0125 | .9875 | .7106 | .0008 | .0010 | .0147 | .0003 | .0004 |
| 48.0 | 522.0 | 61.0 | 491.5 | 2.0 | .0041 | .9959 | .7077 | .0002 | .0003 | .0147 | .0002 | .0002 |
| 60.0+ | 459.0 | 459.0 | 229.5 | .0 | .0000 | 1.0000 | .7077 | ** | ** | .0147 | ** | ** |

** These calculations for the last interval are meaningless.

# Table A.5.11 Life table for infant survival for preceding birth interval = 19-36 months and survival status of previous child = death Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for SPACE Preceding interval = 3 19-36 months
and Q216P Previous Child is still alive = 2 prev. birth death

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1422.0 | 3.0 | 1420.5 | 92.0 | .0648 | .9352 | .9352 | .0648 | .0669 | .0065 | .0065 | .0070 |
| 1.0 | 1327.0 | 10.0 | 1322.0 | 27.0 | .0204 | .9796 | .9161 | .0191 | .0206 | .0074 | .0036 | .0040 |
| 2.0 | 1290.0 | 5.0 | 1287.5 | 24.0 | .0186 | .9814 | .8991 | .0171 | .0188 | .0080 | .0035 | .0038 |
| 3.0 | 1261.0 | 4.0 | 1259.0 | 12.0 | .0095 | .9905 | .8905 | .0086 | .0096 | .0083 | .0025 | .0028 |
| 4.0 | 1245.0 | 8.0 | 1241.0 | 9.0 | .0073 | .9927 | .8840 | .0065 | .0073 | .0085 | .0021 | .0024 |
| 5.0 | 1228.0 | 4.0 | 1226.0 | 6.0 | .0049 | .9951 | .8797 | .0043 | .0049 | .0087 | .0018 | .0020 |
| 6.0 | 1218.0 | 6.0 | 1215.0 | 3.0 | .0025 | .9975 | .8775 | .0022 | .0025 | .0087 | .0013 | .0014 |
| 7.0 | 1209.0 | 13.0 | 1202.5 | 17.0 | .0141 | .9859 | .8651 | .0124 | .0142 | .0091 | .0030 | .0035 |
| 8.0 | 1179.0 | 8.0 | 1175.0 | 6.0 | .0051 | .9949 | .8607 | .0044 | .0051 | .0092 | .0018 | .0021 |
| 9.0 | 1165.0 | 7.0 | 1161.5 | 16.0 | .0138 | .9862 | .8489 | .0119 | .0139 | .0096 | .0029 | .0035 |
| 10.0 | 1142.0 | 4.0 | 1140.0 | 4.0 | .0035 | .9965 | .8459 | .0030 | .0035 | .0097 | .0015 | .0018 |
| 11.0 | 1134.0 | 8.0 | 1130.0 | 2.0 | .0018 | .9982 | .8444 | .0015 | .0018 | .0097 | .0011 | .0013 |
| 12.0 | 1124.0 | 84.0 | 1082.0 | 29.0 | .0268 | .9732 | .8217 | .0019 | .0023 | .0103 | .0003 | .0004 |
| 24.0 | 1011.0 | 96.0 | 963.0 | 23.0 | .0239 | .9761 | .8021 | .0016 | .0020 | .0108 | .0003 | .0004 |
| 36.0 | 892.0 | 110.0 | 837.0 | 12.0 | .0143 | .9857 | .7906 | .0010 | .0012 | .0112 | .0003 | .0003 |
| 48.0 | 770.0 | 110.0 | 715.0 | 2.0 | .0028 | .9972 | .7884 | .0002 | .0002 | .0113 | .0001 | .0002 |
| 60.0+ | 658.0 | 658.0 | 329.0 | .0 | .0000 | 1.0000 | .7884 | ** | ** | .0113 | ** | ** |

** These calculations for the last interval are meaningless.

# Table A.5.12 Life table for infant survival for preceding birth interval = 37+ months and survival status of previous child = death Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for SPACE Preceding interval = 4 37+
and Q216P Previous Child is still alive = 2 prev. birth death

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 832.0 | .0 | 832.0 | 17.0 | .0204 | .9796 | .9796 | .0204 | .0206 | .0049 | .0049 | .0050 |
| 1.0 | 815.0 | 13.0 | 808.5 | 6.0 | .0074 | .9926 | .9723 | .0073 | .0074 | .0057 | .0030 | .0030 |
| 2.0 | 796.0 | 9.0 | 791.5 | 5.0 | .0063 | .9937 | .9662 | .0061 | .0063 | .0063 | .0027 | .0028 |
| 3.0 | 782.0 | 5.0 | 779.5 | 2.0 | .0026 | .9974 | .9637 | .0025 | .0026 | .0065 | .0018 | .0018 |
| 4.0 | 775.0 | 2.0 | 774.0 | 3.0 | .0039 | .9961 | .9599 | .0037 | .0039 | .0068 | .0022 | .0022 |
| 5.0 | 770.0 | 6.0 | 767.0 | 5.0 | .0065 | .9935 | .9537 | .0063 | .0065 | .0073 | .0028 | .0029 |
| 6.0 | 759.0 | 6.0 | 756.0 | 2.0 | .0026 | .9974 | .9512 | .0025 | .0026 | .0075 | .0018 | .0019 |
| 7.0 | 751.0 | 7.0 | 747.5 | 2.0 | .0027 | .9973 | .9486 | .0025 | .0027 | .0077 | .0018 | .0019 |
| 8.0 | 742.0 | 6.0 | 739.0 | 1.0 | .0014 | .9986 | .9473 | .0013 | .0014 | .0078 | .0013 | .0014 |
| 9.0 | 735.0 | 8.0 | 731.0 | 2.0 | .0027 | .9973 | .9447 | .0026 | .0027 | .0080 | .0018 | .0019 |
| 10.0 | 725.0 | 5.0 | 722.5 | .0 | .0000 | 1.0000 | .9447 | .0000 | .0000 | .0080 | .0000 | .0000 |
| 11.0 | 720.0 | 5.0 | 717.5 | .0 | .0000 | 1.0000 | .9447 | .0000 | .0000 | .0080 | .0000 | .0000 |
| 12.0 | 715.0 | 66.0 | 682.0 | 11.0 | .0161 | .9839 | .9295 | .0013 | .0014 | .0091 | .0004 | .0004 |
| 24.0 | 638.0 | 104.0 | 586.0 | 7.0 | .0119 | .9881 | .9184 | .0009 | .0010 | .0099 | .0003 | .0004 |
| 36.0 | 527.0 | 82.0 | 486.0 | 2.0 | .0041 | .9959 | .9146 | .0003 | .0003 | .0102 | .0002 | .0002 |
| 48.0 | 443.0 | 79.0 | 403.5 | .0 | .0000 | 1.0000 | .9146 | .0000 | .0000 | .0102 | .0000 | .0000 |
| 60.0+ | 364.0 | 364.0 | 182.0 | .0 | .0000 | 1.0000 | .9146 | ** | ** | .0102 | ** | ** |

** These calculations for the last interval are meaningless.

# Table A.5.13 Life table for infant survival for education of mother = no education/some, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q108C Level of education of mother = 1 No educ./some

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 18841.0 | 71.0 | 18805.5 | 661.0 | .0351 | .9649 | .9649 | .0351 | .0358 | .0013 | .0013 | .0014 |
| 1.0 | 18109.0 | 117.0 | 18050.5 | 156.0 | .0086 | .9914 | .9565 | .0083 | .0087 | .0015 | .0007 | .0007 |
| 2.0 | 17836.0 | 106.0 | 17783.0 | 116.0 | .0065 | .9935 | .9503 | .0062 | .0065 | .0016 | .0006 | .0006 |
| 3.0 | 17614.0 | 120.0 | 17554.0 | 119.0 | .0068 | .9932 | .9438 | .0064 | .0068 | .0017 | .0006 | .0006 |
| 4.0 | 17375.0 | 117.0 | 17316.5 | 73.0 | .0042 | .9958 | .9399 | .0040 | .0042 | .0017 | .0005 | .0005 |
| 5.0 | 17185.0 | 91.0 | 17139.5 | 53.0 | .0031 | .9969 | .9369 | .0029 | .0031 | .0018 | .0004 | .0004 |
| 6.0 | 17041.0 | 100.0 | 16991.0 | 69.0 | .0041 | .9959 | .9331 | .0038 | .0041 | .0018 | .0005 | .0005 |
| 7.0 | 16872.0 | 120.0 | 16812.0 | 73.0 | .0043 | .9957 | .9291 | .0041 | .0044 | .0019 | .0005 | .0005 |
| 8.0 | 16679.0 | 121.0 | 16618.5 | 68.0 | .0041 | .9959 | .9253 | .0038 | .0041 | .0019 | .0005 | .0005 |
| 9.0 | 16490.0 | 103.0 | 16438.5 | 52.0 | .0032 | .9968 | .9224 | .0029 | .0032 | .0020 | .0004 | .0004 |
| 10.0 | 16335.0 | 96.0 | 16287.0 | 21.0 | .0013 | .9987 | .9212 | .0012 | .0013 | .0020 | .0003 | .0003 |
| 11.0 | 16218.0 | 105.0 | 16165.5 | 17.0 | .0011 | .9989 | .9202 | .0010 | .0011 | .0020 | .0002 | .0003 |
| 12.0 | 16096.0 | 1310.0 | 15441.0 | 224.0 | .0145 | .9855 | .9069 | .0011 | .0012 | .0022 | .0001 | .0001 |
| 24.0 | 14562.0 | 1467.0 | 13828.5 | 165.0 | .0119 | .9881 | .8960 | .0009 | .0010 | .0023 | .0001 | .0001 |
| 36.0 | 12930.0 | 1522.0 | 12169.0 | 94.0 | .0077 | .9923 | .8891 | .0006 | .0006 | .0024 | .0001 | .0001 |
| 48.0 | 11314.0 | 1570.0 | 10529.0 | 44.0 | .0042 | .9958 | .8854 | .0003 | .0003 | .0024 | .0000 | .0001 |
| 60.0+ | 9700.0 | 9700.0 | 4850.0 | .0 | .0000 | 1.0000 | .8854 | ** | ** | .0024 | ** | ** |

** These calculations for the last interval are meaningless.

# Table A.5.14 Life table for infant survival for education of mother = complete primary, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q108C Level of education of mother = 2 Comp. Primary

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 14406.0 | 66.0 | 14373.0 | 376.0 | .0262 | .9738 | .9738 | .0262 | .0265 | .0013 | .0013 | .0014 |
| 1.0 | 13964.0 | 150.0 | 13889.0 | 71.0 | .0051 | .9949 | .9689 | .0050 | .0051 | .0014 | .0006 | .0006 |
| 2.0 | 13743.0 | 137.0 | 13674.5 | 57.0 | .0042 | .9958 | .9648 | .0040 | .0042 | .0015 | .0005 | .0006 |
| 3.0 | 13549.0 | 115.0 | 13491.5 | 45.0 | .0033 | .9967 | .9616 | .0032 | .0033 | .0016 | .0005 | .0005 |
| 4.0 | 13389.0 | 119.0 | 13329.5 | 37.0 | .0028 | .9972 | .9589 | .0027 | .0028 | .0017 | .0004 | .0005 |
| 5.0 | 13233.0 | 111.0 | 13177.5 | 21.0 | .0016 | .9984 | .9574 | .0015 | .0016 | .0017 | .0003 | .0003 |
| 6.0 | 13101.0 | 109.0 | 13046.5 | 35.0 | .0027 | .9973 | .9548 | .0026 | .0027 | .0017 | .0004 | .0005 |
| 7.0 | 12957.0 | 139.0 | 12887.5 | 33.0 | .0026 | .9974 | .9524 | .0024 | .0026 | .0018 | .0004 | .0004 |
| 8.0 | 12785.0 | 114.0 | 12728.0 | 20.0 | .0016 | .9984 | .9509 | .0015 | .0016 | .0018 | .0003 | .0004 |
| 9.0 | 12651.0 | 113.0 | 12594.5 | 27.0 | .0021 | .9979 | .9489 | .0020 | .0021 | .0019 | .0004 | .0004 |
| 10.0 | 12511.0 | 129.0 | 12446.5 | 10.0 | .0008 | .9992 | .9481 | .0008 | .0008 | .0019 | .0002 | .0003 |
| 11.0 | 12372.0 | 124.0 | 12310.0 | 14.0 | .0011 | .9989 | .9470 | .0011 | .0011 | .0019 | .0003 | .0003 |
| 12.0 | 12234.0 | 1308.0 | 11580.0 | 121.0 | .0104 | .9896 | .9371 | .0008 | .0009 | .0021 | .0001 | .0001 |
| 24.0 | 10805.0 | 1451.0 | 10079.5 | 50.0 | .0050 | .9950 | .9325 | .0004 | .0004 | .0022 | .0001 | .0001 |
| 36.0 | 9304.0 | 1369.0 | 8619.5 | 30.0 | .0035 | .9965 | .9292 | .0003 | .0003 | .0022 | .0000 | .0001 |
| 48.0 | 7905.0 | 1306.0 | 7252.0 | 12.0 | .0017 | .9983 | .9277 | .0001 | .0001 | .0023 | .0000 | .0000 |
| 60.0+ | 6587.0 | 6587.0 | 3293.5 | .0 | .0000 | 1.0000 | .9277 | ** | ** | .0023 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.15 Life table for infant survival for education of mother = complete secondary+, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q108C Level of education of mother = 3 Comp Second.+

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 5381.0 | 29.0 | 5366.5 | 111.0 | .0207 | .9793 | .9793 | .0207 | .0209 | .0019 | .0019 | .0020 |
| 1.0 | 5241.0 | 59.0 | 5211.5 | 15.0 | .0029 | .9971 | .9765 | .0028 | .0029 | .0021 | .0007 | .0007 |
| 2.0 | 5167.0 | 62.0 | 5136.0 | 4.0 | .0008 | .9992 | .9757 | .0008 | .0008 | .0021 | .0004 | .0004 |
| 3.0 | 5101.0 | 67.0 | 5067.5 | 5.0 | .0010 | .9990 | .9748 | .0010 | .0010 | .0021 | .0004 | .0004 |
| 4.0 | 5029.0 | 63.0 | 4997.5 | 4.0 | .0008 | .9992 | .9740 | .0008 | .0008 | .0022 | .0004 | .0004 |
| 5.0 | 4962.0 | 51.0 | 4936.5 | 5.0 | .0010 | .9990 | .9730 | .0010 | .0010 | .0022 | .0004 | .0005 |
| 6.0 | 4906.0 | 74.0 | 4869.0 | 1.0 | .0002 | .9998 | .9728 | .0002 | .0002 | .0022 | .0002 | .0002 |
| 7.0 | 4831.0 | 68.0 | 4797.0 | 6.0 | .0013 | .9987 | .9716 | .0012 | .0013 | .0023 | .0005 | .0005 |
| 8.0 | 4757.0 | 64.0 | 4725.0 | 7.0 | .0015 | .9985 | .9702 | .0014 | .0015 | .0023 | .0005 | .0006 |
| 9.0 | 4686.0 | 57.0 | 4657.5 | 1.0 | .0002 | .9998 | .9699 | .0002 | .0002 | .0023 | .0002 | .0002 |
| 10.0 | 4628.0 | 58.0 | 4599.0 | 4.0 | .0009 | .9991 | .9691 | .0008 | .0009 | .0024 | .0004 | .0004 |
| 11.0 | 4566.0 | 44.0 | 4544.0 | 4.0 | .0009 | .9991 | .9682 | .0009 | .0009 | .0024 | .0004 | .0004 |
| 12.0 | 4518.0 | 623.0 | 4206.5 | 11.0 | .0026 | .9974 | .9657 | .0002 | .0002 | .0025 | .0001 | .0001 |
| 24.0 | 3884.0 | 589.0 | 3589.5 | 8.0 | .0022 | .9978 | .9636 | .0002 | .0002 | .0026 | .0001 | .0001 |
| 36.0 | 3287.0 | 553.0 | 3010.5 | 6.0 | .0020 | .9980 | .9616 | .0002 | .0002 | .0027 | .0001 | .0001 |
| 48.0 | 2728.0 | 540.0 | 2458.0 | 4.0 | .0016 | .9984 | .9601 | .0001 | .0001 | .0029 | .0001 | .0001 |
| 60.0+ | 2184.0 | 2184.0 | 1092.0 | .0 | .0000 | 1.0000 | .9601 | ** | ** | .0029 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.16 Life table for infant survival for education of father = no education/some, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q703C Level of education of father = 1 No educ./some

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 15111.0 | 67.0 | 15077.5 | 528.0 | .0350 | .9650 | .9650 | .0350 | .0356 | .0015 | .0015 | .0016 |
| 1.0 | 14516.0 | 104.0 | 14464.0 | 136.0 | .0094 | .9906 | .9559 | .0091 | .0094 | .0017 | .0008 | .0008 |
| 2.0 | 14276.0 | 87.0 | 14232.5 | 104.0 | .0073 | .9927 | .9489 | .0070 | .0073 | .0018 | .0007 | .0007 |
| 3.0 | 14085.0 | 104.0 | 14033.0 | 104.0 | .0074 | .9926 | .9419 | .0070 | .0074 | .0019 | .0007 | .0007 |
| 4.0 | 13877.0 | 96.0 | 13829.0 | 56.0 | .0040 | .9960 | .9381 | .0038 | .0041 | .0020 | .0005 | .0005 |
| 5.0 | 13725.0 | 77.0 | 13686.5 | 49.0 | .0036 | .9964 | .9347 | .0034 | .0036 | .0020 | .0005 | .0005 |
| 6.0 | 13599.0 | 76.0 | 13561.0 | 53.0 | .0039 | .9961 | .9311 | .0037 | .0039 | .0021 | .0005 | .0005 |
| 7.0 | 13470.0 | 99.0 | 13420.5 | 63.0 | .0047 | .9953 | .9267 | .0044 | .0047 | .0021 | .0005 | .0006 |
| 8.0 | 13308.0 | 82.0 | 13267.0 | 50.0 | .0038 | .9962 | .9232 | .0035 | .0038 | .0022 | .0005 | .0005 |
| 9.0 | 13176.0 | 78.0 | 13137.0 | 39.0 | .0030 | .9970 | .9205 | .0027 | .0030 | .0022 | .0004 | .0005 |
| 10.0 | 13059.0 | 82.0 | 13018.0 | 19.0 | .0015 | .9985 | .9191 | .0013 | .0015 | .0022 | .0003 | .0003 |
| 11.0 | 12958.0 | 77.0 | 12919.5 | 15.0 | .0012 | .9988 | .9180 | .0011 | .0012 | .0023 | .0003 | .0003 |
| 12.0 | 12866.0 | 1036.0 | 12348.0 | 185.0 | .0150 | .9850 | .9043 | .0011 | .0013 | .0024 | .0001 | .0001 |
| 24.0 | 11645.0 | 1207.0 | 11041.5 | 140.0 | .0127 | .9873 | .8928 | .0010 | .0011 | .0026 | .0001 | .0001 |
| 36.0 | 10298.0 | 1255.0 | 9670.5 | 76.0 | .0079 | .9921 | .8858 | .0006 | .0007 | .0027 | .0001 | .0001 |
| 48.0 | 8967.0 | 1263.0 | 8335.5 | 33.0 | .0040 | .9960 | .8823 | .0003 | .0003 | .0027 | .0001 | .0001 |
| 60.0+ | 7671.0 | 7671.0 | 3835.5 | .0 | .0000 | 1.0000 | .8823 | ** | ** | .0027 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.17 Life table for infant survival for education of father = complete primary, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q703C Level of education of father = 2 Comp. Primary

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 15359.0 | 56.0 | 15331.0 | 438.0 | .0286 | .9714 | .9714 | .0286 | .0290 | .0013 | .0013 | .0014 |
| 1.0 | 14865.0 | 143.0 | 14793.5 | 84.0 | .0057 | .9943 | .9659 | .0055 | .0057 | .0015 | .0006 | .0006 |
| 2.0 | 14638.0 | 140.0 | 14568.0 | 60.0 | .0041 | .9959 | .9619 | .0040 | .0041 | .0015 | .0005 | .0005 |
| 3.0 | 14438.0 | 120.0 | 14378.0 | 51.0 | .0035 | .9965 | .9585 | .0034 | .0036 | .0016 | .0005 | .0005 |
| 4.0 | 14267.0 | 121.0 | 14206.5 | 45.0 | .0032 | .9968 | .9555 | .0030 | .0032 | .0017 | .0005 | .0005 |
| 5.0 | 14101.0 | 110.0 | 14046.0 | 18.0 | .0013 | .9987 | .9543 | .0012 | .0013 | .0017 | .0003 | .0003 |
| 6.0 | 13973.0 | 101.0 | 13922.5 | 38.0 | .0027 | .9973 | .9517 | .0026 | .0027 | .0017 | .0004 | .0004 |
| 7.0 | 13834.0 | 126.0 | 13771.0 | 41.0 | .0030 | .9970 | .9488 | .0028 | .0030 | .0018 | .0004 | .0005 |
| 8.0 | 13667.0 | 132.0 | 13601.0 | 37.0 | .0027 | .9973 | .9462 | .0026 | .0027 | .0018 | .0004 | .0004 |
| 9.0 | 13498.0 | 123.0 | 13436.5 | 31.0 | .0023 | .9977 | .9441 | .0022 | .0023 | .0019 | .0004 | .0004 |
| 10.0 | 13344.0 | 120.0 | 13284.0 | 12.0 | .0009 | .9991 | .9432 | .0009 | .0009 | .0019 | .0002 | .0003 |
| 11.0 | 13212.0 | 126.0 | 13149.0 | 17.0 | .0013 | .9987 | .9420 | .0012 | .0013 | .0019 | .0003 | .0003 |
| 12.0 | 13069.0 | 1334.0 | 12402.0 | 129.0 | .0104 | .9896 | .9322 | .0008 | .0009 | .0021 | .0001 | .0001 |
| 24.0 | 11606.0 | 1424.0 | 10894.0 | 68.0 | .0062 | .9938 | .9264 | .0005 | .0005 | .0022 | .0001 | .0001 |
| 36.0 | 10114.0 | 1398.0 | 9415.0 | 45.0 | .0048 | .9952 | .9219 | .0004 | .0004 | .0023 | .0001 | .0001 |
| 48.0 | 8671.0 | 1361.0 | 7990.5 | 19.0 | .0024 | .9976 | .9198 | .0002 | .0002 | .0023 | .0000 | .0000 |
| 60.0+ | 7291.0 | 7291.0 | 3645.5 | .0 | .0000 | 1.0000 | .9198 | ** | ** | .0023 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.18 Life table for infant survival for education of father = complete secondary+, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q703C Level of education of father = 3 Comp Second.+

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 8093.0 | 42.0 | 8072.0 | 180.0 | .0223 | .9777 | .9777 | .0223 | .0226 | .0016 | .0016 | .0017 |
| 1.0 | 7871.0 | 77.0 | 7832.5 | 21.0 | .0027 | .9973 | .9751 | .0026 | .0027 | .0017 | .0006 | .0006 |
| 2.0 | 7773.0 | 76.0 | 7735.0 | 13.0 | .0017 | .9983 | .9734 | .0016 | .0017 | .0018 | .0005 | .0005 |
| 3.0 | 7684.0 | 78.0 | 7645.0 | 14.0 | .0018 | .9982 | .9717 | .0018 | .0018 | .0019 | .0005 | .0005 |
| 4.0 | 7592.0 | 82.0 | 7551.0 | 12.0 | .0016 | .9984 | .9701 | .0015 | .0016 | .0019 | .0004 | .0005 |
| 5.0 | 7498.0 | 65.0 | 7465.5 | 11.0 | .0015 | .9985 | .9687 | .0014 | .0015 | .0019 | .0004 | .0004 |
| 6.0 | 7422.0 | 106.0 | 7369.0 | 14.0 | .0019 | .9981 | .9668 | .0018 | .0019 | .0020 | .0005 | .0005 |
| 7.0 | 7302.0 | 101.0 | 7251.5 | 8.0 | .0011 | .9989 | .9658 | .0011 | .0011 | .0020 | .0004 | .0004 |
| 8.0 | 7193.0 | 85.0 | 7150.5 | 8.0 | .0011 | .9989 | .9647 | .0011 | .0011 | .0021 | .0004 | .0004 |
| 9.0 | 7100.0 | 71.0 | 7064.5 | 10.0 | .0014 | .9986 | .9633 | .0014 | .0014 | .0021 | .0004 | .0004 |
| 10.0 | 7019.0 | 80.0 | 6979.0 | 4.0 | .0006 | .9994 | .9628 | .0006 | .0006 | .0021 | .0003 | .0003 |
| 11.0 | 6935.0 | 70.0 | 6900.0 | 3.0 | .0004 | .9996 | .9624 | .0004 | .0004 | .0021 | .0002 | .0003 |
| 12.0 | 6862.0 | 866.0 | 6429.0 | 41.0 | .0064 | .9936 | .9562 | .0005 | .0005 | .0023 | .0001 | .0001 |
| 24.0 | 5955.0 | 871.0 | 5519.5 | 14.0 | .0025 | .9975 | .9538 | .0002 | .0002 | .0024 | .0001 | .0001 |
| 36.0 | 5070.0 | 787.0 | 4676.5 | 9.0 | .0019 | .9981 | .9520 | .0002 | .0002 | .0025 | .0001 | .0001 |
| 48.0 | 4274.0 | 784.0 | 3882.0 | 8.0 | .0021 | .9979 | .9500 | .0002 | .0002 | .0026 | .0001 | .0001 |
| 60.0+ | 3482.0 | 3482.0 | 1741.0 | .0 | .0000 | 1.0000 | .9500 | ** | ** | .0026 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.19 Life table for infant survival for ability to read newspaper = easily and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q114 Can read a letter or newspaper = 1 Easily
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 7956.0 | 40.0 | 7936.0 | 165.0 | .0208 | .9792 | .9792 | .0208 | .0210 | .0016 | .0016 | .0016 |
| 1.0 | 7751.0 | 66.0 | 7718.0 | 18.0 | .0023 | .9977 | .9769 | .0023 | .0023 | .0017 | .0005 | .0006 |
| 2.0 | 7667.0 | 63.0 | 7635.5 | 9.0 | .0012 | .9988 | .9758 | .0012 | .0012 | .0017 | .0004 | .0004 |
| 3.0 | 7595.0 | 79.0 | 7555.5 | 18.0 | .0024 | .9976 | .9734 | .0023 | .0024 | .0018 | .0005 | .0006 |
| 4.0 | 7498.0 | 65.0 | 7465.5 | 9.0 | .0012 | .9988 | .9723 | .0012 | .0012 | .0018 | .0004 | .0004 |
| 5.0 | 7424.0 | 54.0 | 7397.0 | 8.0 | .0011 | .9989 | .9712 | .0011 | .0011 | .0019 | .0004 | .0004 |
| 6.0 | 7362.0 | 70.0 | 7327.0 | 10.0 | .0014 | .9986 | .9699 | .0013 | .0014 | .0019 | .0004 | .0004 |
| 7.0 | 7282.0 | 91.0 | 7236.5 | 10.0 | .0014 | .9986 | .9686 | .0013 | .0014 | .0020 | .0004 | .0004 |
| 8.0 | 7181.0 | 63.0 | 7149.5 | 6.0 | .0008 | .9992 | .9677 | .0008 | .0008 | .0020 | .0003 | .0003 |
| 9.0 | 7112.0 | 68.0 | 7078.0 | 4.0 | .0006 | .9994 | .9672 | .0005 | .0006 | .0020 | .0003 | .0003 |
| 10.0 | 7040.0 | 76.0 | 7002.0 | 4.0 | .0006 | .9994 | .9666 | .0006 | .0006 | .0020 | .0003 | .0003 |
| 11.0 | 6960.0 | 66.0 | 6927.0 | 5.0 | .0007 | .9993 | .9659 | .0007 | .0007 | .0021 | .0003 | .0003 |
| 12.0 | 6889.0 | 732.0 | 6523.0 | 28.0 | .0043 | .9957 | .9618 | .0003 | .0004 | .0022 | .0001 | .0001 |
| 24.0 | 6129.0 | 804.0 | 5727.0 | 15.0 | .0026 | .9974 | .9593 | .0002 | .0002 | .0023 | .0001 | .0001 |
| 36.0 | 5310.0 | 750.0 | 4935.0 | 9.0 | .0018 | .9982 | .9575 | .0001 | .0002 | .0023 | .0000 | .0001 |
| 48.0 | 4551.0 | 719.0 | 4191.5 | 8.0 | .0019 | .9981 | .9557 | .0002 | .0002 | .0024 | .0001 | .0001 |
| 60.0+ | 3824.0 | 3824.0 | 1912.0 | .0 | .0000 | 1.0000 | .9557 | ** | ** | .0024 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.20 Life table for infant survival for ability to read newspaper = not at all/difficulty and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q114 Can read a letter or newspaper = 2 Not at all/difficult
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1774.0 | 7.0 | 1770.5 | 56.0 | .0316 | .9684 | .9684 | .0316 | .0321 | .0042 | .0042 | .0043 |
| 1.0 | 1711.0 | 11.0 | 1705.5 | 15.0 | .0088 | .9912 | .9599 | .0085 | .0088 | .0047 | .0022 | .0023 |
| 2.0 | 1685.0 | 9.0 | 1680.5 | 7.0 | .0042 | .9958 | .9559 | .0040 | .0042 | .0049 | .0015 | .0016 |
| 3.0 | 1669.0 | 15.0 | 1661.5 | 9.0 | .0054 | .9946 | .9507 | .0052 | .0054 | .0052 | .0017 | .0018 |
| 4.0 | 1645.0 | 5.0 | 1642.5 | 3.0 | .0018 | .9982 | .9489 | .0017 | .0018 | .0052 | .0010 | .0011 |
| 5.0 | 1637.0 | 13.0 | 1630.5 | 5.0 | .0031 | .9969 | .9460 | .0029 | .0031 | .0054 | .0013 | .0014 |
| 6.0 | 1619.0 | 8.0 | 1615.0 | 5.0 | .0031 | .9969 | .9431 | .0029 | .0031 | .0055 | .0013 | .0014 |
| 7.0 | 1606.0 | 7.0 | 1602.5 | 8.0 | .0050 | .9950 | .9384 | .0047 | .0050 | .0057 | .0017 | .0018 |
| 8.0 | 1591.0 | 12.0 | 1585.0 | 7.0 | .0044 | .9956 | .9343 | .0041 | .0044 | .0059 | .0016 | .0017 |
| 9.0 | 1572.0 | 8.0 | 1568.0 | 6.0 | .0038 | .9962 | .9307 | .0036 | .0038 | .0061 | .0015 | .0016 |
| 10.0 | 1558.0 | 6.0 | 1555.0 | 3.0 | .0019 | .9981 | .9289 | .0018 | .0019 | .0062 | .0010 | .0011 |
| 11.0 | 1549.0 | 10.0 | 1544.0 | 1.0 | .0006 | .9994 | .9283 | .0006 | .0006 | .0062 | .0006 | .0006 |
| 12.0 | 1538.0 | 111.0 | 1482.5 | 14.0 | .0094 | .9906 | .9195 | .0007 | .0008 | .0066 | .0002 | .0002 |
| 24.0 | 1413.0 | 144.0 | 1341.0 | 12.0 | .0089 | .9911 | .9113 | .0007 | .0007 | .0069 | .0002 | .0002 |
| 36.0 | 1257.0 | 137.0 | 1188.5 | 5.0 | .0042 | .9958 | .9074 | .0003 | .0004 | .0071 | .0001 | .0002 |
| 48.0 | 1115.0 | 151.0 | 1039.5 | 3.0 | .0029 | .9971 | .9048 | .0002 | .0002 | .0072 | .0001 | .0001 |
| 60.0+ | 961.0 | 961.0 | 480.5 | .0 | .0000 | 1.0000 | .9048 | ** | ** | .0072 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.21 Life table for infant survival for ability to read newspaper = easily and place of residence = rural, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q114 Can read a letter or newspaper = 1 Easily
and AREA Type of place of residence = 2 Rural

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 16400.0 | 75.0 | 16362.5 | 474.0 | .0290 | .9710 | .9710 | .0290 | .0294 | .0013 | .0013 | .0013 |
| 1.0 | 15851.0 | 172.0 | 15765.0 | 86.0 | .0055 | .9945 | .9657 | .0053 | .0055 | .0014 | .0006 | .0006 |
| 2.0 | 15593.0 | 167.0 | 15509.5 | 70.0 | .0045 | .9955 | .9614 | .0044 | .0045 | .0015 | .0005 | .0005 |
| 3.0 | 15356.0 | 132.0 | 15290.0 | 57.0 | .0037 | .9963 | .9578 | .0036 | .0037 | .0016 | .0005 | .0005 |
| 4.0 | 15167.0 | 142.0 | 15096.0 | 47.0 | .0031 | .9969 | .9548 | .0030 | .0031 | .0016 | .0004 | .0005 |
| 5.0 | 14978.0 | 132.0 | 14912.0 | 32.0 | .0021 | .9979 | .9528 | .0020 | .0021 | .0017 | .0004 | .0004 |
| 6.0 | 14814.0 | 142.0 | 14743.0 | 47.0 | .0032 | .9968 | .9497 | .0030 | .0032 | .0017 | .0004 | .0005 |
| 7.0 | 14625.0 | 147.0 | 14551.5 | 36.0 | .0025 | .9975 | .9474 | .0023 | .0025 | .0018 | .0004 | .0004 |
| 8.0 | 14442.0 | 152.0 | 14366.0 | 39.0 | .0027 | .9973 | .9448 | .0026 | .0027 | .0018 | .0004 | .0004 |
| 9.0 | 14251.0 | 146.0 | 14178.0 | 37.0 | .0026 | .9974 | .9423 | .0025 | .0026 | .0018 | .0004 | .0004 |
| 10.0 | 14068.0 | 132.0 | 14002.0 | 12.0 | .0009 | .9991 | .9415 | .0008 | .0009 | .0019 | .0002 | .0002 |
| 11.0 | 13924.0 | 127.0 | 13860.5 | 18.0 | .0013 | .9987 | .9403 | .0012 | .0013 | .0019 | .0003 | .0003 |
| 12.0 | 13779.0 | 1524.0 | 13017.0 | 141.0 | .0108 | .9892 | .9301 | .0008 | .0009 | .0020 | .0001 | .0001 |
| 24.0 | 12114.0 | 1643.0 | 11292.5 | 73.0 | .0065 | .9935 | .9241 | .0005 | .0005 | .0021 | .0001 | .0001 |
| 36.0 | 10398.0 | 1561.0 | 9617.5 | 50.0 | .0052 | .9948 | .9193 | .0004 | .0004 | .0022 | .0001 | .0001 |
| 48.0 | 8787.0 | 1498.0 | 8038.0 | 19.0 | .0024 | .9976 | .9171 | .0002 | .0002 | .0023 | .0000 | .0000 |
| 60.0+ | 7270.0 | 7270.0 | 3635.0 | .0 | .0000 | 1.0000 | .9171 | ** | ** | .0023 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.22 Life table for infant survival for ability to read newspaper = not at all/difficulty and place of residence = rural, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q114 Can read a letter or newspaper = 2 Not at all/difficult
and AREA Type of place of residence = 2 Rural

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 12498.0 | 44.0 | 12476.0 | 453.0 | .0363 | .9637 | .9637 | .0363 | .0370 | .0017 | .0017 | .0017 |
| 1.0 | 12001.0 | 77.0 | 11962.5 | 123.0 | .0103 | .9897 | .9538 | .0099 | .0103 | .0019 | .0009 | .0009 |
| 2.0 | 11801.0 | 66.0 | 11768.0 | 91.0 | .0077 | .9923 | .9464 | .0074 | .0078 | .0020 | .0008 | .0008 |
| 3.0 | 11644.0 | 76.0 | 11606.0 | 85.0 | .0073 | .9927 | .9395 | .0069 | .0074 | .0021 | .0007 | .0008 |
| 4.0 | 11483.0 | 87.0 | 11439.5 | 55.0 | .0048 | .9952 | .9350 | .0045 | .0048 | .0022 | .0006 | .0006 |
| 5.0 | 11341.0 | 54.0 | 11314.0 | 34.0 | .0030 | .9970 | .9321 | .0028 | .0030 | .0023 | .0005 | .0005 |
| 6.0 | 11253.0 | 63.0 | 11221.5 | 43.0 | .0038 | .9962 | .9286 | .0036 | .0038 | .0023 | .0005 | .0006 |
| 7.0 | 11147.0 | 82.0 | 11106.0 | 58.0 | .0052 | .9948 | .9237 | .0048 | .0052 | .0024 | .0006 | .0007 |
| 8.0 | 11007.0 | 72.0 | 10971.0 | 43.0 | .0039 | .9961 | .9201 | .0036 | .0039 | .0024 | .0006 | .0006 |
| 9.0 | 10892.0 | 51.0 | 10866.5 | 33.0 | .0030 | .9970 | .9173 | .0028 | .0030 | .0025 | .0005 | .0005 |
| 10.0 | 10808.0 | 69.0 | 10773.5 | 16.0 | .0015 | .9985 | .9159 | .0014 | .0015 | .0025 | .0003 | .0004 |
| 11.0 | 10723.0 | 70.0 | 10688.0 | 11.0 | .0010 | .9990 | .9150 | .0009 | .0010 | .0025 | .0003 | .0003 |
| 12.0 | 10642.0 | 874.0 | 10205.0 | 173.0 | .0170 | .9830 | .8995 | .0013 | .0014 | .0027 | .0001 | .0001 |
| 24.0 | 9595.0 | 916.0 | 9137.0 | 123.0 | .0135 | .9865 | .8874 | .0010 | .0011 | .0029 | .0001 | .0001 |
| 36.0 | 8556.0 | 996.0 | 8058.0 | 66.0 | .0082 | .9918 | .8801 | .0006 | .0007 | .0030 | .0001 | .0001 |
| 48.0 | 7494.0 | 1048.0 | 6970.0 | 30.0 | .0043 | .9957 | .8763 | .0003 | .0004 | .0031 | .0001 | .0001 |
| 60.0+ | 6416.0 | 6416.0 | 3208.0 | .0 | .0000 | 1.0000 | .8763 | ** | ** | .0031 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.23 Life table for infant survival for ability to speak Indonesian language = yes and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q120 Can speak Bahasa Indonesia = 1 Yes
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 9333.0 | 46.0 | 9310.0 | 206.0 | .0221 | .9779 | .9779 | .0221 | .0224 | .0015 | .0015 | .0016 |
| 1.0 | 9081.0 | 75.0 | 9043.5 | 26.0 | .0029 | .9971 | .9751 | .0028 | .0029 | .0016 | .0006 | .0006 |
| 2.0 | 8980.0 | 67.0 | 8946.5 | 16.0 | .0018 | .9982 | .9733 | .0017 | .0018 | .0017 | .0004 | .0004 |
| 3.0 | 8897.0 | 92.0 | 8851.0 | 25.0 | .0028 | .9972 | .9706 | .0027 | .0028 | .0018 | .0005 | .0006 |
| 4.0 | 8780.0 | 69.0 | 8745.5 | 11.0 | .0013 | .9987 | .9693 | .0012 | .0013 | .0018 | .0004 | .0004 |
| 5.0 | 8700.0 | 64.0 | 8668.0 | 12.0 | .0014 | .9986 | .9680 | .0013 | .0014 | .0018 | .0004 | .0004 |
| 6.0 | 8624.0 | 74.0 | 8587.0 | 14.0 | .0016 | .9984 | .9664 | .0016 | .0016 | .0019 | .0004 | .0004 |
| 7.0 | 8536.0 | 97.0 | 8487.5 | 14.0 | .0016 | .9984 | .9648 | .0016 | .0017 | .0019 | .0004 | .0004 |
| 8.0 | 8425.0 | 75.0 | 8387.5 | 10.0 | .0012 | .9988 | .9637 | .0012 | .0012 | .0020 | .0004 | .0004 |
| 9.0 | 8340.0 | 74.0 | 8303.0 | 9.0 | .0011 | .9989 | .9626 | .0010 | .0011 | .0020 | .0003 | .0004 |
| 10.0 | 8257.0 | 79.0 | 8217.5 | 6.0 | .0007 | .9993 | .9619 | .0007 | .0007 | .0020 | .0003 | .0003 |
| 11.0 | 8172.0 | 74.0 | 8135.0 | 6.0 | .0007 | .9993 | .9612 | .0007 | .0007 | .0020 | .0003 | .0003 |
| 12.0 | 8092.0 | 822.0 | 7681.0 | 37.0 | .0048 | .9952 | .9566 | .0004 | .0004 | .0021 | .0001 | .0001 |
| 24.0 | 7233.0 | 916.0 | 6775.0 | 24.0 | .0035 | .9965 | .9532 | .0003 | .0003 | .0022 | .0001 | .0001 |
| 36.0 | 6293.0 | 859.0 | 5863.5 | 12.0 | .0020 | .9980 | .9513 | .0002 | .0002 | .0023 | .0000 | .0000 |
| 48.0 | 5422.0 | 835.0 | 5004.5 | 10.0 | .0020 | .9980 | .9494 | .0002 | .0002 | .0024 | .0001 | .0001 |
| 60.0+ | 4577.0 | 4577.0 | 2288.5 | .0 | .0000 | 1.0000 | .9494 | ** | ** | .0024 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.24 Life table for infant survival for ability to speak Indonesian language = no and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q120 Can speak Bahasa Indonesia = 2 No
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 397.0 | 1.0 | 396.5 | 15.0 | .0378 | .9622 | .9622 | .0378 | .0386 | .0096 | .0096 | .0100 |
| 1.0 | 381.0 | 2.0 | 380.0 | 7.0 | .0184 | .9816 | .9444 | .0177 | .0186 | .0115 | .0066 | .0070 |
| 2.0 | 372.0 | 5.0 | 369.5 | .0 | .0000 | 1.0000 | .9444 | .0000 | .0000 | .0115 | .0000 | .0000 |
| 3.0 | 367.0 | 2.0 | 366.0 | 2.0 | .0055 | .9945 | .9393 | .0052 | .0055 | .0120 | .0036 | .0039 |
| 4.0 | 363.0 | 1.0 | 362.5 | 1.0 | .0028 | .9972 | .9367 | .0026 | .0028 | .0123 | .0026 | .0028 |
| 5.0 | 361.0 | 3.0 | 359.5 | 1.0 | .0028 | .9972 | .9341 | .0026 | .0028 | .0125 | .0026 | .0028 |
| 6.0 | 357.0 | 4.0 | 355.0 | 1.0 | .0028 | .9972 | .9315 | .0026 | .0028 | .0127 | .0026 | .0028 |
| 7.0 | 352.0 | 1.0 | 351.5 | 4.0 | .0114 | .9886 | .9209 | .0106 | .0114 | .0136 | .0053 | .0057 |
| 8.0 | 347.0 | .0 | 347.0 | 3.0 | .0086 | .9914 | .9129 | .0080 | .0087 | .0143 | .0046 | .0050 |
| 9.0 | 344.0 | 2.0 | 343.0 | 1.0 | .0029 | .9971 | .9102 | .0027 | .0029 | .0145 | .0027 | .0029 |
| 10.0 | 341.0 | 3.0 | 339.5 | 1.0 | .0029 | .9971 | .9076 | .0027 | .0029 | .0147 | .0027 | .0029 |
| 11.0 | 337.0 | 2.0 | 336.0 | .0 | .0000 | 1.0000 | .9076 | .0000 | .0000 | .0147 | .0000 | .0000 |
| 12.0 | 335.0 | 21.0 | 324.5 | 5.0 | .0154 | .9846 | .8936 | .0012 | .0013 | .0157 | .0005 | .0006 |
| 24.0 | 309.0 | 32.0 | 293.0 | 3.0 | .0102 | .9898 | .8844 | .0008 | .0009 | .0164 | .0004 | .0005 |
| 36.0 | 274.0 | 28.0 | 260.0 | 2.0 | .0077 | .9923 | .8776 | .0006 | .0006 | .0170 | .0004 | .0005 |
| 48.0 | 244.0 | 35.0 | 226.5 | 1.0 | .0044 | .9956 | .8737 | .0003 | .0004 | .0174 | .0003 | .0004 |
| 60.0+ | 208.0 | 208.0 | 104.0 | .0 | .0000 | 1.0000 | .8737 | ** | ** | .0174 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.25 Life table for infant survival for ability to speak Indonesian language = yes and place of residence = rural, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q120 Can speak Bahasa Indonesia = 1 Yes
and AREA Type of place of residence = 2 Rural

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 23710.0 | 97.0 | 23661.5 | 771.0 | .0326 | .9674 | .9674 | .0326 | .0331 | .0012 | .0012 | .0012 |
| 1.0 | 22842.0 | 218.0 | 22733.0 | 158.0 | .0070 | .9930 | .9607 | .0067 | .0070 | .0013 | .0005 | .0006 |
| 2.0 | 22466.0 | 202.0 | 22365.0 | 126.0 | .0056 | .9944 | .9553 | .0054 | .0056 | .0013 | .0005 | .0005 |
| 3.0 | 22138.0 | 170.0 | 22053.0 | 107.0 | .0049 | .9951 | .9506 | .0046 | .0049 | .0014 | .0004 | .0005 |
| 4.0 | 21861.0 | 188.0 | 21767.0 | 78.0 | .0036 | .9964 | .9472 | .0034 | .0036 | .0015 | .0004 | .0004 |
| 5.0 | 21595.0 | 163.0 | 21513.5 | 53.0 | .0025 | .9975 | .9449 | .0023 | .0025 | .0015 | .0003 | .0003 |
| 6.0 | 21379.0 | 176.0 | 21291.0 | 72.0 | .0034 | .9966 | .9417 | .0032 | .0034 | .0015 | .0004 | .0004 |
| 7.0 | 21131.0 | 192.0 | 21035.0 | 63.0 | .0030 | .9970 | .9389 | .0028 | .0030 | .0016 | .0004 | .0004 |
| 8.0 | 20876.0 | 197.0 | 20777.5 | 64.0 | .0031 | .9969 | .9360 | .0029 | .0031 | .0016 | .0004 | .0004 |
| 9.0 | 20615.0 | 175.0 | 20527.5 | 61.0 | .0030 | .9970 | .9332 | .0028 | .0030 | .0016 | .0004 | .0004 |
| 10.0 | 20379.0 | 174.0 | 20292.0 | 23.0 | .0011 | .9989 | .9322 | .0011 | .0011 | .0017 | .0002 | .0002 |
| 11.0 | 20182.0 | 164.0 | 20100.0 | 24.0 | .0012 | .9988 | .9310 | .0011 | .0012 | .0017 | .0002 | .0002 |
| 12.0 | 19994.0 | 2027.0 | 18980.5 | 234.0 | .0123 | .9877 | .9196 | .0010 | .0010 | .0018 | .0001 | .0001 |
| 24.0 | 17733.0 | 2162.0 | 16652.0 | 135.0 | .0081 | .9919 | .9121 | .0006 | .0007 | .0019 | .0001 | .0001 |
| 36.0 | 15436.0 | 2172.0 | 14350.0 | 87.0 | .0061 | .9939 | .9066 | .0005 | .0005 | .0020 | .0000 | .0001 |
| 48.0 | 13177.0 | 2116.0 | 12119.0 | 38.0 | .0031 | .9969 | .9037 | .0002 | .0003 | .0020 | .0000 | .0000 |
| 60.0+ | 11023.0 | 11023.0 | 5511.5 | .0 | .0000 | 1.0000 | .9037 | ** | ** | .0020 | ** | ** |

** These calculations for the last interval are meaningless.

## Table A.5.26 Life table for infant survival for ability to speak Indonesian language = no and place of residence = rural, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for Q120 Can speak Bahasa Indonesia = 2 No
and AREA Type of place of residence = 2 Rural

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 5188.0 | 22.0 | 5177.0 | 156.0 | .0301 | .9699 | .9699 | .0301 | .0306 | .0024 | .0024 | .0024 |
| 1.0 | 5010.0 | 31.0 | 4994.5 | 51.0 | .0102 | .9898 | .9600 | .0099 | .0103 | .0027 | .0014 | .0014 |
| 2.0 | 4928.0 | 31.0 | 4912.5 | 35.0 | .0071 | .9929 | .9531 | .0068 | .0072 | .0029 | .0012 | .0012 |
| 3.0 | 4862.0 | 38.0 | 4843.0 | 35.0 | .0072 | .9928 | .9462 | .0069 | .0073 | .0031 | .0012 | .0012 |
| 4.0 | 4789.0 | 41.0 | 4768.5 | 24.0 | .0050 | .9950 | .9415 | .0048 | .0050 | .0033 | .0010 | .0010 |
| 5.0 | 4724.0 | 23.0 | 4712.5 | 13.0 | .0028 | .9972 | .9389 | .0026 | .0028 | .0033 | .0007 | .0008 |
| 6.0 | 4688.0 | 29.0 | 4673.5 | 18.0 | .0039 | .9961 | .9353 | .0036 | .0039 | .0034 | .0009 | .0009 |
| 7.0 | 4641.0 | 37.0 | 4622.5 | 31.0 | .0067 | .9933 | .9290 | .0063 | .0067 | .0036 | .0011 | .0012 |
| 8.0 | 4573.0 | 27.0 | 4559.5 | 18.0 | .0039 | .9961 | .9253 | .0037 | .0040 | .0037 | .0009 | .0009 |
| 9.0 | 4528.0 | 22.0 | 4517.0 | 9.0 | .0020 | .9980 | .9235 | .0018 | .0020 | .0037 | .0006 | .0007 |
| 10.0 | 4497.0 | 27.0 | 4483.5 | 5.0 | .0011 | .9989 | .9224 | .0010 | .0011 | .0038 | .0005 | .0005 |
| 11.0 | 4465.0 | 33.0 | 4448.5 | 5.0 | .0011 | .9989 | .9214 | .0010 | .0011 | .0038 | .0005 | .0005 |
| 12.0 | 4427.0 | 371.0 | 4241.5 | 80.0 | .0189 | .9811 | .9040 | .0014 | .0016 | .0042 | .0002 | .0002 |
| 24.0 | 3976.0 | 397.0 | 3777.5 | 61.0 | .0161 | .9839 | .8894 | .0012 | .0014 | .0045 | .0002 | .0002 |
| 36.0 | 3518.0 | 385.0 | 3325.5 | 29.0 | .0087 | .9913 | .8817 | .0006 | .0007 | .0047 | .0001 | .0001 |
| 48.0 | 3104.0 | 430.0 | 2889.0 | 11.0 | .0038 | .9962 | .8783 | .0003 | .0003 | .0048 | .0001 | .0001 |
| 60.0+ | 2663.0 | 2663.0 | 1331.5 | .0 | .0000 | 1.0000 | .8783 | ** | ** | .0048 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.27 Life table for infant survival for source of drinking water = pipe water and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H15 Source of drinking water = 1 Pipe water
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 3086.0 | 16.0 | 3078.0 | 72.0 | .0234 | .9766 | .9766 | .0234 | .0237 | .0027 | .0027 | .0028 |
| 1.0 | 2998.0 | 23.0 | 2986.5 | 7.0 | .0023 | .9977 | .9743 | .0023 | .0023 | .0029 | .0009 | .0009 |
| 2.0 | 2968.0 | 18.0 | 2959.0 | 3.0 | .0010 | .9990 | .9733 | .0010 | .0010 | .0029 | .0006 | .0006 |
| 3.0 | 2947.0 | 31.0 | 2931.5 | 6.0 | .0020 | .9980 | .9713 | .0020 | .0020 | .0030 | .0008 | .0008 |
| 4.0 | 2910.0 | 19.0 | 2900.5 | .0 | .0000 | 1.0000 | .9713 | .0000 | .0000 | .0030 | .0000 | .0000 |
| 5.0 | 2891.0 | 26.0 | 2878.0 | 3.0 | .0010 | .9990 | .9703 | .0010 | .0010 | .0031 | .0006 | .0006 |
| 6.0 | 2862.0 | 26.0 | 2849.0 | 3.0 | .0011 | .9989 | .9693 | .0010 | .0011 | .0031 | .0006 | .0006 |
| 7.0 | 2833.0 | 27.0 | 2819.5 | 4.0 | .0014 | .9986 | .9679 | .0014 | .0014 | .0032 | .0007 | .0007 |
| 8.0 | 2802.0 | 22.0 | 2791.0 | 1.0 | .0004 | .9996 | .9676 | .0003 | .0004 | .0032 | .0003 | .0004 |
| 9.0 | 2779.0 | 31.0 | 2763.5 | 3.0 | .0011 | .9989 | .9665 | .0011 | .0011 | .0033 | .0006 | .0006 |
| 10.0 | 2745.0 | 31.0 | 2729.5 | 2.0 | .0007 | .9993 | .9658 | .0007 | .0007 | .0033 | .0005 | .0005 |
| 11.0 | 2712.0 | 27.0 | 2698.5 | 2.0 | .0007 | .9993 | .9651 | .0007 | .0007 | .0033 | .0005 | .0005 |
| 12.0 | 2683.0 | 273.0 | 2546.5 | 5.0 | .0020 | .9980 | .9632 | .0002 | .0002 | .0034 | .0001 | .0001 |
| 24.0 | 2405.0 | 295.0 | 2257.5 | 4.0 | .0018 | .9982 | .9615 | .0001 | .0001 | .0035 | .0001 | .0001 |
| 36.0 | 2106.0 | 264.0 | 1974.0 | 4.0 | .0020 | .9980 | .9596 | .0002 | .0002 | .0037 | .0001 | .0001 |
| 48.0 | 1838.0 | 297.0 | 1689.5 | 3.0 | .0018 | .9982 | .9579 | .0001 | .0001 | .0038 | .0001 | .0001 |
| 60.0+ | 1538.0 | 1538.0 | 769.0 | .0 | .0000 | 1.0000 | .9579 | ** | ** | .0038 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.28 Life table for infant survival for source of drinking water = pump, protective well and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H15 Source of drinking water = 2 Pump, prot.well
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 5476.0 | 26.0 | 5463.0 | 111.0 | .0203 | .9797 | .9797 | .0203 | .0205 | .0019 | .0019 | .0019 |
| 1.0 | 5339.0 | 39.0 | 5319.5 | 20.0 | .0038 | .9962 | .9760 | .0037 | .0038 | .0021 | .0008 | .0008 |
| 2.0 | 5280.0 | 45.0 | 5257.5 | 10.0 | .0019 | .9981 | .9741 | .0019 | .0019 | .0021 | .0006 | .0006 |
| 3.0 | 5225.0 | 50.0 | 5200.0 | 18.0 | .0035 | .9965 | .9708 | .0034 | .0035 | .0023 | .0008 | .0008 |
| 4.0 | 5157.0 | 41.0 | 5136.5 | 8.0 | .0016 | .9984 | .9693 | .0015 | .0016 | .0023 | .0005 | .0006 |
| 5.0 | 5108.0 | 37.0 | 5089.5 | 7.0 | .0014 | .9986 | .9679 | .0013 | .0014 | .0024 | .0005 | .0005 |
| 6.0 | 5064.0 | 47.0 | 5040.5 | 8.0 | .0016 | .9984 | .9664 | .0015 | .0016 | .0024 | .0005 | .0006 |
| 7.0 | 5009.0 | 56.0 | 4981.0 | 9.0 | .0018 | .9982 | .9646 | .0017 | .0018 | .0025 | .0006 | .0006 |
| 8.0 | 4944.0 | 44.0 | 4922.0 | 8.0 | .0016 | .9984 | .9631 | .0016 | .0016 | .0026 | .0006 | .0006 |
| 9.0 | 4892.0 | 42.0 | 4871.0 | 4.0 | .0008 | .9992 | .9623 | .0008 | .0008 | .0026 | .0004 | .0004 |
| 10.0 | 4846.0 | 45.0 | 4823.5 | 5.0 | .0010 | .9990 | .9613 | .0010 | .0010 | .0026 | .0004 | .0005 |
| 11.0 | 4796.0 | 38.0 | 4777.0 | 4.0 | .0008 | .9992 | .9605 | .0008 | .0008 | .0027 | .0004 | .0004 |
| 12.0 | 4754.0 | 467.0 | 4520.5 | 29.0 | .0064 | .9936 | .9543 | .0005 | .0005 | .0029 | .0001 | .0001 |
| 24.0 | 4258.0 | 550.0 | 3983.0 | 16.0 | .0040 | .9960 | .9505 | .0003 | .0003 | .0030 | .0001 | .0001 |
| 36.0 | 3692.0 | 514.0 | 3435.0 | 7.0 | .0020 | .9980 | .9485 | .0002 | .0002 | .0031 | .0001 | .0001 |
| 48.0 | 3171.0 | 460.0 | 2941.0 | 6.0 | .0020 | .9980 | .9466 | .0002 | .0002 | .0032 | .0001 | .0001 |
| 60.0+ | 2705.0 | 2705.0 | 1352.5 | .0 | .0000 | 1.0000 | .9466 | ** | ** | .0032 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.29 Life table for infant survival for source of drinking water = others and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H15 Source of drinking water = 3 Other
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi- nating | Propn Sur- viving | Cumul Propn Surv at End | Proba- bility Densty | Hazard Rate | SE of Cumul Sur- viving | SE of Proba- bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1168.0 | 5.0 | 1165.5 | 38.0 | .0326 | .9674 | .9674 | .0326 | .0331 | .0052 | .0052 | .0054 |
| 1.0 | 1125.0 | 15.0 | 1117.5 | 6.0 | .0054 | .9946 | .9622 | .0052 | .0054 | .0056 | .0021 | .0022 |
| 2.0 | 1104.0 | 9.0 | 1099.5 | 3.0 | .0027 | .9973 | .9596 | .0026 | .0027 | .0058 | .0015 | .0016 |
| 3.0 | 1092.0 | 13.0 | 1085.5 | 3.0 | .0028 | .9972 | .9569 | .0027 | .0028 | .0060 | .0015 | .0016 |
| 4.0 | 1076.0 | 10.0 | 1071.0 | 4.0 | .0037 | .9963 | .9534 | .0036 | .0037 | .0062 | .0018 | .0019 |
| 5.0 | 1062.0 | 4.0 | 1060.0 | 3.0 | .0028 | .9972 | .9507 | .0027 | .0028 | .0064 | .0016 | .0016 |
| 6.0 | 1055.0 | 5.0 | 1052.5 | 4.0 | .0038 | .9962 | .9470 | .0036 | .0038 | .0066 | .0018 | .0019 |
| 7.0 | 1046.0 | 15.0 | 1038.5 | 5.0 | .0048 | .9952 | .9425 | .0046 | .0048 | .0069 | .0020 | .0022 |
| 8.0 | 1026.0 | 9.0 | 1021.5 | 4.0 | .0039 | .9961 | .9388 | .0037 | .0039 | .0071 | .0018 | .0020 |
| 9.0 | 1013.0 | 3.0 | 1011.5 | 3.0 | .0030 | .9970 | .9360 | .0028 | .0030 | .0073 | .0016 | .0017 |
| 10.0 | 1007.0 | 6.0 | 1004.0 | .0 | .0000 | 1.0000 | .9360 | .0000 | .0000 | .0073 | .0000 | .0000 |
| 11.0 | 1001.0 | 11.0 | 995.5 | .0 | .0000 | 1.0000 | .9360 | .0000 | .0000 | .0073 | .0000 | .0000 |
| 12.0 | 990.0 | 103.0 | 938.5 | 8.0 | .0085 | .9915 | .9280 | .0007 | .0007 | .0077 | .0002 | .0003 |
| 24.0 | 879.0 | 103.0 | 827.5 | 7.0 | .0085 | .9915 | .9202 | .0007 | .0007 | .0082 | .0002 | .0003 |
| 36.0 | 769.0 | 109.0 | 714.5 | 3.0 | .0042 | .9958 | .9163 | .0003 | .0004 | .0085 | .0002 | .0002 |
| 48.0 | 657.0 | 113.0 | 600.5 | 2.0 | .0033 | .9967 | .9133 | .0003 | .0003 | .0087 | .0002 | .0002 |
| 60.0+ | 542.0 | 542.0 | 271.0 | .0 | .0000 | 1.0000 | .9133 | ** | ** | .0087 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.30 Life table for infant survival for source of drinking water = pipe water and place of residence = rural, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H15 Source of drinking water = 1 Pipe water
and AREA Type of place of residence = 2 Rural

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi- nating | Propn Sur- viving | Cumul Propn Surv at End | Proba- bility Densty | Hazard Rate | SE of Cumul Sur- viving | SE of Proba- bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1403.0 | 3.0 | 1401.5 | 26.0 | .0186 | .9814 | .9814 | .0186 | .0187 | .0036 | .0036 | .0037 |
| 1.0 | 1374.0 | 11.0 | 1368.5 | 6.0 | .0044 | .9956 | .9771 | .0043 | .0044 | .0040 | .0018 | .0018 |
| 2.0 | 1357.0 | 8.0 | 1353.0 | 2.0 | .0015 | .9985 | .9757 | .0014 | .0015 | .0041 | .0010 | .0010 |
| 3.0 | 1347.0 | 4.0 | 1345.0 | 1.0 | .0007 | .9993 | .9750 | .0007 | .0007 | .0042 | .0007 | .0007 |
| 4.0 | 1342.0 | 13.0 | 1335.5 | 1.0 | .0007 | .9993 | .9742 | .0007 | .0007 | .0042 | .0007 | .0007 |
| 5.0 | 1328.0 | 9.0 | 1323.5 | 3.0 | .0023 | .9977 | .9720 | .0022 | .0023 | .0044 | .0013 | .0013 |
| 6.0 | 1316.0 | 19.0 | 1306.5 | 4.0 | .0031 | .9969 | .9691 | .0030 | .0031 | .0046 | .0015 | .0015 |
| 7.0 | 1293.0 | 13.0 | 1286.5 | 2.0 | .0016 | .9984 | .9676 | .0015 | .0016 | .0048 | .0011 | .0011 |
| 8.0 | 1278.0 | 11.0 | 1272.5 | 3.0 | .0024 | .9976 | .9653 | .0023 | .0024 | .0049 | .0013 | .0014 |
| 9.0 | 1264.0 | 12.0 | 1258.0 | 1.0 | .0008 | .9992 | .9645 | .0008 | .0008 | .0050 | .0008 | .0008 |
| 10.0 | 1251.0 | 12.0 | 1245.0 | .0 | .0000 | 1.0000 | .9645 | .0000 | .0000 | .0050 | .0000 | .0000 |
| 11.0 | 1239.0 | 8.0 | 1235.0 | 1.0 | .0008 | .9992 | .9637 | .0008 | .0008 | .0050 | .0008 | .0008 |
| 12.0 | 1230.0 | 117.0 | 1171.5 | 7.0 | .0060 | .9940 | .9580 | .0005 | .0005 | .0055 | .0002 | .0002 |
| 24.0 | 1106.0 | 123.0 | 1044.5 | 3.0 | .0029 | .9971 | .9552 | .0002 | .0002 | .0057 | .0001 | .0001 |
| 36.0 | 980.0 | 126.0 | 917.0 | 2.0 | .0022 | .9978 | .9531 | .0002 | .0002 | .0058 | .0001 | .0001 |
| 48.0 | 852.0 | 141.0 | 781.5 | .0 | .0000 | 1.0000 | .9531 | .0000 | .0000 | .0058 | .0000 | .0000 |
| 60.0+ | 711.0 | 711.0 | 355.5 | .0 | .0000 | 1.0000 | .9531 | ** | ** | .0058 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.31 Life table for infant survival for source of drinking water = pump, protective well and place of residence = rural, Indonesia, 1994 IDHS

```
Life Table
  Survival Variable  AGEDEATH
               for   H15       Source of drinking water          =     2  Pump, prot.well
               and   AREA      Type of place of residence        =     2  Rural
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 12022.0 | 54.0 | 11995.0 | 383.0 | .0319 | .9681 | .9681 | .0319 | .0324 | .0016 | .0016 | .0017 |
| 1.0 | 11585.0 | 125.0 | 11522.5 | 74.0 | .0064 | .9936 | .9619 | .0062 | .0064 | .0018 | .0007 | .0007 |
| 2.0 | 11386.0 | 108.0 | 11332.0 | 64.0 | .0056 | .9944 | .9564 | .0054 | .0057 | .0019 | .0007 | .0007 |
| 3.0 | 11214.0 | 94.0 | 11167.0 | 56.0 | .0050 | .9950 | .9516 | .0048 | .0050 | .0020 | .0006 | .0007 |
| 4.0 | 11064.0 | 98.0 | 11015.0 | 40.0 | .0036 | .9964 | .9482 | .0035 | .0036 | .0020 | .0005 | .0006 |
| 5.0 | 10926.0 | 88.0 | 10882.0 | 28.0 | .0026 | .9974 | .9457 | .0024 | .0026 | .0021 | .0005 | .0005 |
| 6.0 | 10810.0 | 92.0 | 10764.0 | 28.0 | .0026 | .9974 | .9433 | .0025 | .0026 | .0021 | .0005 | .0005 |
| 7.0 | 10690.0 | 97.0 | 10641.5 | 27.0 | .0025 | .9975 | .9409 | .0024 | .0025 | .0022 | .0005 | .0005 |
| 8.0 | 10566.0 | 99.0 | 10516.5 | 32.0 | .0030 | .9970 | .9380 | .0029 | .0030 | .0022 | .0005 | .0005 |
| 9.0 | 10435.0 | 98.0 | 10386.0 | 26.0 | .0025 | .9975 | .9357 | .0023 | .0025 | .0023 | .0005 | .0005 |
| 10.0 | 10311.0 | 74.0 | 10274.0 | 11.0 | .0011 | .9989 | .9347 | .0010 | .0011 | .0023 | .0003 | .0003 |
| 11.0 | 10226.0 | 83.0 | 10184.5 | 14.0 | .0014 | .9986 | .9334 | .0013 | .0014 | .0023 | .0003 | .0004 |
| 12.0 | 10129.0 | 989.0 | 9634.5 | 116.0 | .0120 | .9880 | .9221 | .0009 | .0010 | .0025 | .0001 | .0001 |
| 24.0 | 9024.0 | 1090.0 | 8479.0 | 63.0 | .0074 | .9926 | .9153 | .0006 | .0006 | .0026 | .0001 | .0001 |
| 36.0 | 7871.0 | 1079.0 | 7331.5 | 44.0 | .0060 | .9940 | .9098 | .0005 | .0005 | .0027 | .0001 | .0001 |
| 48.0 | 6748.0 | 1073.0 | 6211.5 | 20.0 | .0032 | .9968 | .9069 | .0002 | .0003 | .0028 | .0001 | .0001 |
| 60.0+ | 5655.0 | 5655.0 | 2827.5 | .0 | .0000 | 1.0000 | .9069 | ** | ** | .0028 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.32 Life table for infant survival for source of drinking water = others and place of residence = rural, Indonesia, 1994 IDHS

```
Life Table
  Survival Variable  AGEDEATH
               for   H15       Source of drinking water          =     3  Other
               and   AREA      Type of place of residence        =     2  Rural
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 15473.0 | 62.0 | 15442.0 | 518.0 | .0335 | .9665 | .9665 | .0335 | .0341 | .0014 | .0014 | .0015 |
| 1.0 | 14893.0 | 113.0 | 14836.5 | 129.0 | .0087 | .9913 | .9581 | .0084 | .0087 | .0016 | .0007 | .0008 |
| 2.0 | 14651.0 | 117.0 | 14592.5 | 95.0 | .0065 | .9935 | .9518 | .0062 | .0065 | .0017 | .0006 | .0007 |
| 3.0 | 14439.0 | 110.0 | 14384.0 | 85.0 | .0059 | .9941 | .9462 | .0056 | .0059 | .0018 | .0006 | .0006 |
| 4.0 | 14244.0 | 118.0 | 14185.0 | 61.0 | .0043 | .9957 | .9421 | .0041 | .0043 | .0019 | .0005 | .0006 |
| 5.0 | 14065.0 | 89.0 | 14020.5 | 35.0 | .0025 | .9975 | .9398 | .0024 | .0025 | .0019 | .0004 | .0004 |
| 6.0 | 13941.0 | 94.0 | 13894.0 | 58.0 | .0042 | .9958 | .9358 | .0039 | .0042 | .0020 | .0005 | .0005 |
| 7.0 | 13789.0 | 119.0 | 13729.5 | 65.0 | .0047 | .9953 | .9314 | .0044 | .0047 | .0020 | .0005 | .0006 |
| 8.0 | 13605.0 | 114.0 | 13548.0 | 47.0 | .0035 | .9965 | .9282 | .0032 | .0035 | .0021 | .0005 | .0005 |
| 9.0 | 13444.0 | 87.0 | 13400.5 | 43.0 | .0032 | .9968 | .9252 | .0030 | .0032 | .0021 | .0005 | .0005 |
| 10.0 | 13314.0 | 115.0 | 13256.5 | 17.0 | .0013 | .9987 | .9240 | .0012 | .0013 | .0022 | .0003 | .0003 |
| 11.0 | 13182.0 | 106.0 | 13129.0 | 14.0 | .0011 | .9989 | .9230 | .0010 | .0011 | .0022 | .0003 | .0003 |
| 12.0 | 13062.0 | 1292.0 | 12416.0 | 191.0 | .0154 | .9846 | .9088 | .0012 | .0013 | .0024 | .0001 | .0001 |
| 24.0 | 11579.0 | 1346.0 | 10906.0 | 130.0 | .0119 | .9881 | .8980 | .0009 | .0010 | .0025 | .0001 | .0001 |
| 36.0 | 10103.0 | 1352.0 | 9427.0 | 70.0 | .0074 | .9926 | .8913 | .0006 | .0006 | .0026 | .0001 | .0001 |
| 48.0 | 8681.0 | 1332.0 | 8015.0 | 29.0 | .0036 | .9964 | .8881 | .0003 | .0003 | .0027 | .0000 | .0001 |
| 60.0+ | 7320.0 | 7320.0 | 3660.0 | .0 | .0000 | 1.0000 | .8881 | ** | ** | .0027 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.33 Life table for infant survival for type of toilet facilities = private with septic tank and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H17 Type of toilet facility = 1 Priv. with septic
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 4031.0 | 23.0 | 4019.5 | 74.0 | .0184 | .9816 | .9816 | .0184 | .0186 | .0021 | .0021 | .0022 |
| 1.0 | 3934.0 | 32.0 | 3918.0 | 9.0 | .0023 | .9977 | .9793 | .0023 | .0023 | .0022 | .0008 | .0008 |
| 2.0 | 3893.0 | 23.0 | 3881.5 | 3.0 | .0008 | .9992 | .9786 | .0008 | .0008 | .0023 | .0004 | .0004 |
| 3.0 | 3867.0 | 42.0 | 3846.0 | 10.0 | .0026 | .9974 | .9760 | .0025 | .0026 | .0024 | .0008 | .0008 |
| 4.0 | 3815.0 | 21.0 | 3804.5 | .0 | .0000 | 1.0000 | .9760 | .0000 | .0000 | .0024 | .0000 | .0000 |
| 5.0 | 3794.0 | 26.0 | 3781.0 | 3.0 | .0008 | .9992 | .9753 | .0008 | .0008 | .0025 | .0004 | .0005 |
| 6.0 | 3765.0 | 38.0 | 3746.0 | 2.0 | .0005 | .9995 | .9747 | .0005 | .0005 | .0025 | .0004 | .0004 |
| 7.0 | 3725.0 | 33.0 | 3708.5 | 4.0 | .0011 | .9989 | .9737 | .0011 | .0011 | .0025 | .0005 | .0005 |
| 8.0 | 3688.0 | 36.0 | 3670.0 | 2.0 | .0005 | .9995 | .9732 | .0005 | .0005 | .0026 | .0004 | .0004 |
| 9.0 | 3650.0 | 38.0 | 3631.0 | 2.0 | .0006 | .9994 | .9726 | .0005 | .0006 | .0026 | .0004 | .0004 |
| 10.0 | 3610.0 | 39.0 | 3590.5 | 1.0 | .0003 | .9997 | .9723 | .0003 | .0003 | .0026 | .0003 | .0003 |
| 11.0 | 3570.0 | 27.0 | 3556.5 | 2.0 | .0006 | .9994 | .9718 | .0005 | .0006 | .0026 | .0004 | .0004 |
| 12.0 | 3541.0 | 348.0 | 3367.0 | 11.0 | .0033 | .9967 | .9686 | .0003 | .0003 | .0028 | .0001 | .0001 |
| 24.0 | 3182.0 | 386.0 | 2989.0 | 4.0 | .0013 | .9987 | .9673 | .0001 | .0001 | .0029 | .0001 | .0001 |
| 36.0 | 2792.0 | 352.0 | 2616.0 | 6.0 | .0023 | .9977 | .9651 | .0002 | .0002 | .0030 | .0001 | .0001 |
| 48.0 | 2434.0 | 379.0 | 2244.5 | 3.0 | .0013 | .9987 | .9638 | .0001 | .0001 | .0031 | .0001 | .0001 |
| 60.0+ | 2052.0 | 2052.0 | 1026.0 | .0 | .0000 | 1.0000 | .9638 | ** | ** | .0031 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.34 Life table for infant survival for type of toilet facilities = private without septic tank and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H17 Type of toilet facility = 2 Priv.no septic
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 2463.0 | 12.0 | 2457.0 | 63.0 | .0256 | .9744 | .9744 | .0256 | .0260 | .0032 | .0032 | .0033 |
| 1.0 | 2388.0 | 20.0 | 2378.0 | 7.0 | .0029 | .9971 | .9715 | .0029 | .0029 | .0034 | .0011 | .0011 |
| 2.0 | 2361.0 | 21.0 | 2350.5 | 2.0 | .0009 | .9991 | .9707 | .0008 | .0009 | .0034 | .0006 | .0006 |
| 3.0 | 2338.0 | 21.0 | 2327.5 | 2.0 | .0009 | .9991 | .9698 | .0008 | .0009 | .0035 | .0006 | .0006 |
| 4.0 | 2315.0 | 25.0 | 2302.5 | 5.0 | .0022 | .9978 | .9677 | .0021 | .0022 | .0036 | .0009 | .0010 |
| 5.0 | 2285.0 | 21.0 | 2274.5 | 1.0 | .0004 | .9996 | .9673 | .0004 | .0004 | .0036 | .0004 | .0004 |
| 6.0 | 2263.0 | 18.0 | 2254.0 | 4.0 | .0018 | .9982 | .9656 | .0017 | .0018 | .0037 | .0009 | .0009 |
| 7.0 | 2241.0 | 33.0 | 2224.5 | 8.0 | .0036 | .9964 | .9621 | .0035 | .0036 | .0039 | .0012 | .0013 |
| 8.0 | 2200.0 | 13.0 | 2193.5 | 4.0 | .0018 | .9982 | .9604 | .0018 | .0018 | .0040 | .0009 | .0009 |
| 9.0 | 2183.0 | 18.0 | 2174.0 | 2.0 | .0009 | .9991 | .9595 | .0009 | .0009 | .0040 | .0006 | .0007 |
| 10.0 | 2163.0 | 24.0 | 2151.0 | 1.0 | .0005 | .9995 | .9590 | .0004 | .0005 | .0040 | .0004 | .0005 |
| 11.0 | 2138.0 | 26.0 | 2125.0 | .0 | .0000 | 1.0000 | .9590 | .0000 | .0000 | .0040 | .0000 | .0000 |
| 12.0 | 2112.0 | 225.0 | 1999.5 | 7.0 | .0035 | .9965 | .9557 | .0003 | .0003 | .0042 | .0001 | .0001 |
| 24.0 | 1880.0 | 248.0 | 1756.0 | 5.0 | .0028 | .9972 | .9529 | .0002 | .0002 | .0044 | .0001 | .0001 |
| 36.0 | 1627.0 | 223.0 | 1515.5 | 2.0 | .0013 | .9987 | .9517 | .0001 | .0001 | .0045 | .0001 | .0001 |
| 48.0 | 1402.0 | 206.0 | 1299.0 | 1.0 | .0008 | .9992 | .9510 | .0001 | .0001 | .0045 | .0001 | .0001 |
| 60.0+ | 1195.0 | 1195.0 | 597.5 | .0 | .0000 | 1.0000 | .9510 | ** | ** | .0045 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.35 Life table for infant survival for type of toilet facilities = shared/public and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H17 Type of toilet facility = 3 Shared,Public
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1523.0 | 8.0 | 1519.0 | 35.0 | .0230 | .9770 | .9770 | .0230 | .0233 | .0038 | .0038 | .0039 |
| 1.0 | 1480.0 | 11.0 | 1474.5 | 4.0 | .0027 | .9973 | .9743 | .0027 | .0027 | .0041 | .0013 | .0014 |
| 2.0 | 1465.0 | 17.0 | 1456.5 | 5.0 | .0034 | .9966 | .9710 | .0033 | .0034 | .0043 | .0015 | .0015 |
| 3.0 | 1443.0 | 20.0 | 1433.0 | 10.0 | .0070 | .9930 | .9642 | .0068 | .0070 | .0048 | .0021 | .0022 |
| 4.0 | 1413.0 | 14.0 | 1406.0 | 5.0 | .0036 | .9964 | .9608 | .0034 | .0036 | .0050 | .0015 | .0016 |
| 5.0 | 1394.0 | 5.0 | 1391.5 | 2.0 | .0014 | .9986 | .9594 | .0014 | .0014 | .0051 | .0010 | .0010 |
| 6.0 | 1387.0 | 17.0 | 1378.5 | 3.0 | .0022 | .9978 | .9573 | .0021 | .0022 | .0052 | .0012 | .0013 |
| 7.0 | 1367.0 | 14.0 | 1360.0 | 2.0 | .0015 | .9985 | .9559 | .0014 | .0015 | .0053 | .0010 | .0010 |
| 8.0 | 1351.0 | 12.0 | 1345.0 | 3.0 | .0022 | .9978 | .9538 | .0021 | .0022 | .0054 | .0012 | .0013 |
| 9.0 | 1336.0 | 12.0 | 1330.0 | 3.0 | .0023 | .9977 | .9516 | .0022 | .0023 | .0056 | .0012 | .0013 |
| 10.0 | 1321.0 | 9.0 | 1316.5 | 3.0 | .0023 | .9977 | .9494 | .0022 | .0023 | .0057 | .0013 | .0013 |
| 11.0 | 1309.0 | 13.0 | 1302.5 | 3.0 | .0023 | .9977 | .9472 | .0022 | .0023 | .0058 | .0013 | .0013 |
| 12.0 | 1293.0 | 137.0 | 1224.5 | 14.0 | .0114 | .9886 | .9364 | .0009 | .0010 | .0064 | .0002 | .0003 |
| 24.0 | 1142.0 | 155.0 | 1064.5 | 6.0 | .0056 | .9944 | .9311 | .0004 | .0005 | .0067 | .0002 | .0002 |
| 36.0 | 981.0 | 143.0 | 909.5 | 3.0 | .0033 | .9967 | .9281 | .0003 | .0003 | .0070 | .0001 | .0002 |
| 48.0 | 835.0 | 141.0 | 764.5 | 2.0 | .0026 | .9974 | .9256 | .0002 | .0002 | .0071 | .0001 | .0002 |
| 60.0+ | 692.0 | 692.0 | 346.0 | .0 | .0000 | 1.0000 | .9256 | ** | ** | .0071 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.36 Life table for infant survival for type of toilet facilities = river/stream/ pit/bush and place of residence = urban, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H17 Type of toilet facility = 4 River,stream,pit,bush
and AREA Type of place of residence = 1 Urban

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1713.0 | 4.0 | 1711.0 | 49.0 | .0286 | .9714 | .9714 | .0286 | .0291 | .0040 | .0040 | .0042 |
| 1.0 | 1660.0 | 14.0 | 1653.0 | 13.0 | .0079 | .9921 | .9637 | .0076 | .0079 | .0045 | .0021 | .0022 |
| 2.0 | 1633.0 | 11.0 | 1627.5 | 6.0 | .0037 | .9963 | .9602 | .0036 | .0037 | .0047 | .0014 | .0015 |
| 3.0 | 1616.0 | 11.0 | 1610.5 | 5.0 | .0031 | .9969 | .9572 | .0030 | .0031 | .0049 | .0013 | .0014 |
| 4.0 | 1600.0 | 10.0 | 1595.0 | 2.0 | .0013 | .9987 | .9560 | .0012 | .0013 | .0050 | .0008 | .0009 |
| 5.0 | 1588.0 | 15.0 | 1580.5 | 7.0 | .0044 | .9956 | .9518 | .0042 | .0044 | .0052 | .0016 | .0017 |
| 6.0 | 1566.0 | 5.0 | 1563.5 | 6.0 | .0038 | .9962 | .9481 | .0037 | .0038 | .0054 | .0015 | .0016 |
| 7.0 | 1555.0 | 18.0 | 1546.0 | 4.0 | .0026 | .9974 | .9456 | .0025 | .0026 | .0055 | .0012 | .0013 |
| 8.0 | 1533.0 | 14.0 | 1526.0 | 4.0 | .0026 | .9974 | .9432 | .0025 | .0026 | .0056 | .0012 | .0013 |
| 9.0 | 1515.0 | 8.0 | 1511.0 | 3.0 | .0020 | .9980 | .9413 | .0019 | .0020 | .0057 | .0011 | .0011 |
| 10.0 | 1504.0 | 10.0 | 1499.0 | 2.0 | .0013 | .9987 | .9400 | .0013 | .0013 | .0058 | .0009 | .0009 |
| 11.0 | 1492.0 | 10.0 | 1487.0 | 1.0 | .0007 | .9993 | .9394 | .0006 | .0007 | .0058 | .0006 | .0007 |
| 12.0 | 1481.0 | 133.0 | 1414.5 | 10.0 | .0071 | .9929 | .9328 | .0006 | .0006 | .0061 | .0002 | .0002 |
| 24.0 | 1338.0 | 159.0 | 1258.5 | 12.0 | .0095 | .9905 | .9239 | .0007 | .0008 | .0066 | .0002 | .0002 |
| 36.0 | 1167.0 | 169.0 | 1082.5 | 3.0 | .0028 | .9972 | .9213 | .0002 | .0002 | .0067 | .0001 | .0001 |
| 48.0 | 995.0 | 144.0 | 923.0 | 5.0 | .0054 | .9946 | .9163 | .0004 | .0005 | .0071 | .0002 | .0002 |
| 60.0+ | 846.0 | 846.0 | 423.0 | .0 | .0000 | 1.0000 | .9163 | ** | ** | .0071 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.37 Life table for infant survival for type of toilet facilities = private with septic tank and place of residence = rural, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H17 Type of toilet facility = 1 Priv. with septic
and AREA Type of place of residence = 2 Rural

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 2661.0 | 6.0 | 2658.0 | 52.0 | .0196 | .9804 | .9804 | .0196 | .0198 | .0027 | .0027 | .0027 |
| 1.0 | 2603.0 | 22.0 | 2592.0 | 13.0 | .0050 | .9950 | .9755 | .0049 | .0050 | .0030 | .0014 | .0014 |
| 2.0 | 2568.0 | 16.0 | 2560.0 | 6.0 | .0023 | .9977 | .9732 | .0023 | .0023 | .0031 | .0009 | .0010 |
| 3.0 | 2546.0 | 11.0 | 2540.5 | 2.0 | .0008 | .9992 | .9725 | .0008 | .0008 | .0032 | .0005 | .0006 |
| 4.0 | 2533.0 | 24.0 | 2521.0 | 3.0 | .0012 | .9988 | .9713 | .0012 | .0012 | .0032 | .0007 | .0007 |
| 5.0 | 2506.0 | 23.0 | 2494.5 | 4.0 | .0016 | .9984 | .9698 | .0016 | .0016 | .0033 | .0008 | .0008 |
| 6.0 | 2479.0 | 26.0 | 2466.0 | 5.0 | .0020 | .9980 | .9678 | .0020 | .0020 | .0034 | .0009 | .0009 |
| 7.0 | 2448.0 | 15.0 | 2440.5 | 4.0 | .0016 | .9984 | .9662 | .0016 | .0016 | .0035 | .0008 | .0008 |
| 8.0 | 2429.0 | 28.0 | 2415.0 | 3.0 | .0012 | .9988 | .9650 | .0012 | .0012 | .0036 | .0007 | .0007 |
| 9.0 | 2398.0 | 25.0 | 2385.5 | 3.0 | .0013 | .9987 | .9638 | .0012 | .0013 | .0036 | .0007 | .0007 |
| 10.0 | 2370.0 | 19.0 | 2360.5 | 3.0 | .0013 | .9987 | .9626 | .0012 | .0013 | .0037 | .0007 | .0007 |
| 11.0 | 2348.0 | 17.0 | 2339.5 | 3.0 | .0013 | .9987 | .9613 | .0012 | .0013 | .0038 | .0007 | .0007 |
| 12.0 | 2328.0 | 245.0 | 2205.5 | 18.0 | .0082 | .9918 | .9535 | .0007 | .0007 | .0042 | .0002 | .0002 |
| 24.0 | 2065.0 | 240.0 | 1945.0 | 9.0 | .0046 | .9954 | .9491 | .0004 | .0004 | .0044 | .0001 | .0001 |
| 36.0 | 1816.0 | 235.0 | 1698.5 | 6.0 | .0035 | .9965 | .9457 | .0003 | .0003 | .0046 | .0001 | .0001 |
| 48.0 | 1575.0 | 254.0 | 1448.0 | 6.0 | .0041 | .9959 | .9418 | .0003 | .0003 | .0048 | .0001 | .0001 |
| 60.0+ | 1315.0 | 1315.0 | 657.5 | .0 | .0000 | 1.0000 | .9418 | ** | ** | .0048 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.38 Life table for infant survival for type of toilet facilities = private without septic tank and place of residence = rural, Indonesia, 1994 IDHS

Life Table
Survival Variable AGEDEATH
for H17 Type of toilet facility = 2 Priv.no septic
and AREA Type of place of residence = 2 Rural

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 6877.0 | 26.0 | 6864.0 | 213.0 | .0310 | .9690 | .9690 | .0310 | .0315 | .0021 | .0021 | .0022 |
| 1.0 | 6638.0 | 57.0 | 6609.5 | 48.0 | .0073 | .9927 | .9619 | .0070 | .0073 | .0023 | .0010 | .0011 |
| 2.0 | 6533.0 | 56.0 | 6505.0 | 25.0 | .0038 | .9962 | .9582 | .0037 | .0039 | .0024 | .0007 | .0008 |
| 3.0 | 6452.0 | 41.0 | 6431.5 | 25.0 | .0039 | .9961 | .9545 | .0037 | .0039 | .0025 | .0007 | .0008 |
| 4.0 | 6386.0 | 52.0 | 6360.0 | 14.0 | .0022 | .9978 | .9524 | .0021 | .0022 | .0026 | .0006 | .0006 |
| 5.0 | 6320.0 | 41.0 | 6299.5 | 11.0 | .0017 | .9983 | .9507 | .0017 | .0017 | .0026 | .0005 | .0005 |
| 6.0 | 6268.0 | 45.0 | 6245.5 | 16.0 | .0026 | .9974 | .9483 | .0024 | .0026 | .0027 | .0006 | .0006 |
| 7.0 | 6207.0 | 64.0 | 6175.0 | 20.0 | .0032 | .9968 | .9452 | .0031 | .0032 | .0028 | .0007 | .0007 |
| 8.0 | 6123.0 | 57.0 | 6094.5 | 15.0 | .0025 | .9975 | .9429 | .0023 | .0025 | .0028 | .0006 | .0006 |
| 9.0 | 6051.0 | 46.0 | 6028.0 | 9.0 | .0015 | .9985 | .9415 | .0014 | .0015 | .0029 | .0005 | .0005 |
| 10.0 | 5996.0 | 51.0 | 5970.5 | 7.0 | .0012 | .9988 | .9404 | .0011 | .0012 | .0029 | .0004 | .0004 |
| 11.0 | 5938.0 | 40.0 | 5918.0 | 2.0 | .0003 | .9997 | .9401 | .0003 | .0003 | .0029 | .0002 | .0002 |
| 12.0 | 5896.0 | 613.0 | 5589.5 | 60.0 | .0107 | .9893 | .9300 | .0008 | .0009 | .0031 | .0001 | .0001 |
| 24.0 | 5223.0 | 587.0 | 4929.5 | 43.0 | .0087 | .9913 | .9219 | .0007 | .0007 | .0033 | .0001 | .0001 |
| 36.0 | 4593.0 | 604.0 | 4291.0 | 19.0 | .0044 | .9956 | .9178 | .0003 | .0004 | .0035 | .0001 | .0001 |
| 48.0 | 3970.0 | 602.0 | 3669.0 | 3.0 | .0008 | .9992 | .9170 | .0001 | .0001 | .0035 | .0000 | .0000 |
| 60.0+ | 3365.0 | 3365.0 | 1682.5 | .0 | .0000 | 1.0000 | .9170 | ** | ** | .0035 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.39 Life table for infant survival for type of toilet facilities = shared/public and place of residence = rural, Indonesia, 1994 IDHS

```
Life Table
  Survival Variable  AGEDEATH
                for  H17        Type of toilet facility              =       3  Shared,Public
                and  AREA       Type of place of residence           =       2  Rural
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 1836.0 | 11.0 | 1830.5 | 63.0 | .0344 | .9656 | .9656 | .0344 | .0350 | .0043 | .0043 | .0044 |
| 1.0 | 1762.0 | 15.0 | 1754.5 | 9.0 | .0051 | .9949 | .9606 | .0050 | .0051 | .0045 | .0016 | .0017 |
| 2.0 | 1738.0 | 23.0 | 1726.5 | 11.0 | .0064 | .9936 | .9545 | .0061 | .0064 | .0049 | .0018 | .0019 |
| 3.0 | 1704.0 | 15.0 | 1696.5 | 8.0 | .0047 | .9953 | .9500 | .0045 | .0047 | .0051 | .0016 | .0017 |
| 4.0 | 1681.0 | 15.0 | 1673.5 | 10.0 | .0060 | .9940 | .9443 | .0057 | .0060 | .0054 | .0018 | .0019 |
| 5.0 | 1656.0 | 14.0 | 1649.0 | 1.0 | .0006 | .9994 | .9438 | .0006 | .0006 | .0054 | .0006 | .0006 |
| 6.0 | 1641.0 | 13.0 | 1634.5 | 6.0 | .0037 | .9963 | .9403 | .0035 | .0037 | .0056 | .0014 | .0015 |
| 7.0 | 1622.0 | 10.0 | 1617.0 | 5.0 | .0031 | .9969 | .9374 | .0029 | .0031 | .0057 | .0013 | .0014 |
| 8.0 | 1607.0 | 11.0 | 1601.5 | 1.0 | .0006 | .9994 | .9368 | .0006 | .0006 | .0057 | .0006 | .0006 |
| 9.0 | 1595.0 | 12.0 | 1589.0 | 4.0 | .0025 | .9975 | .9344 | .0024 | .0025 | .0058 | .0012 | .0013 |
| 10.0 | 1579.0 | 13.0 | 1572.5 | 1.0 | .0006 | .9994 | .9338 | .0006 | .0006 | .0059 | .0006 | .0006 |
| 11.0 | 1565.0 | 10.0 | 1560.0 | 1.0 | .0006 | .9994 | .9333 | .0006 | .0006 | .0059 | .0006 | .0006 |
| 12.0 | 1554.0 | 161.0 | 1473.5 | 13.0 | .0088 | .9912 | .9250 | .0007 | .0007 | .0063 | .0002 | .0002 |
| 24.0 | 1380.0 | 163.0 | 1298.5 | 8.0 | .0062 | .9938 | .9193 | .0005 | .0005 | .0065 | .0002 | .0002 |
| 36.0 | 1209.0 | 166.0 | 1126.0 | 8.0 | .0071 | .9929 | .9128 | .0005 | .0006 | .0069 | .0002 | .0002 |
| 48.0 | 1035.0 | 169.0 | 950.5 | 3.0 | .0032 | .9968 | .9099 | .0002 | .0003 | .0071 | .0001 | .0002 |
| 60.0+ | 863.0 | 863.0 | 431.5 | .0 | .0000 | 1.0000 | .9099 | ** | ** | .0071 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.5.40 Life table for infant survival for type of toilet facilities = river/stream/pit /bush and place of residence = rural, Indonesia, 1994 IDHS

```
Life Table
  Survival Variable  AGEDEATH
                for  H17        Type of toilet facility              =       4  River,stream,pit,bus
                and  AREA       Type of place of residence           =       2  Rural
```

| Intrvl Start Time | Number Entrng this Intrvl | Number Wdrawn During Intrvl | Number Exposd to Risk | Number of Termnl Events | Propn Termi-nating | Propn Sur-viving | Cumul Propn Surv at End | Proba-bility Densty | Hazard Rate | SE of Cumul Sur-viving | SE of Proba-bility Densty | SE of Hazard Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .0 | 17524.0 | 76.0 | 17486.0 | 599.0 | .0343 | .9657 | .9657 | .0343 | .0349 | .0014 | .0014 | .0014 |
| 1.0 | 16849.0 | 155.0 | 16771.5 | 139.0 | .0083 | .9917 | .9577 | .0080 | .0083 | .0015 | .0007 | .0007 |
| 2.0 | 16555.0 | 138.0 | 16486.0 | 119.0 | .0072 | .9928 | .9508 | .0069 | .0072 | .0016 | .0006 | .0007 |
| 3.0 | 16298.0 | 141.0 | 16227.5 | 107.0 | .0066 | .9934 | .9446 | .0063 | .0066 | .0017 | .0006 | .0006 |
| 4.0 | 16050.0 | 138.0 | 15981.0 | 75.0 | .0047 | .9953 | .9401 | .0044 | .0047 | .0018 | .0005 | .0005 |
| 5.0 | 15837.0 | 108.0 | 15783.0 | 50.0 | .0032 | .9968 | .9371 | .0030 | .0032 | .0018 | .0004 | .0004 |
| 6.0 | 15679.0 | 121.0 | 15618.5 | 63.0 | .0040 | .9960 | .9334 | .0038 | .0040 | .0019 | .0005 | .0005 |
| 7.0 | 15495.0 | 140.0 | 15425.0 | 65.0 | .0042 | .9958 | .9294 | .0039 | .0042 | .0020 | .0005 | .0005 |
| 8.0 | 15290.0 | 128.0 | 15226.0 | 63.0 | .0041 | .9959 | .9256 | .0038 | .0041 | .0020 | .0005 | .0005 |
| 9.0 | 15099.0 | 114.0 | 15042.0 | 54.0 | .0036 | .9964 | .9223 | .0033 | .0036 | .0020 | .0005 | .0005 |
| 10.0 | 14931.0 | 118.0 | 14872.0 | 17.0 | .0011 | .9989 | .9212 | .0011 | .0011 | .0021 | .0003 | .0003 |
| 11.0 | 14796.0 | 130.0 | 14731.0 | 23.0 | .0016 | .9984 | .9198 | .0014 | .0016 | .0021 | .0003 | .0003 |
| 12.0 | 14643.0 | 1379.0 | 13953.5 | 223.0 | .0160 | .9840 | .9051 | .0012 | .0013 | .0023 | .0001 | .0001 |
| 24.0 | 13041.0 | 1569.0 | 12256.5 | 136.0 | .0111 | .9889 | .8950 | .0008 | .0009 | .0024 | .0001 | .0001 |
| 36.0 | 11336.0 | 1552.0 | 10560.0 | 83.0 | .0079 | .9921 | .8880 | .0006 | .0007 | .0025 | .0001 | .0001 |
| 48.0 | 9701.0 | 1521.0 | 8940.5 | 37.0 | .0041 | .9959 | .8843 | .0003 | .0003 | .0026 | .0001 | .0001 |
| 60.0+ | 8143.0 | 8143.0 | 4071.5 | .0 | .0000 | 1.0000 | .8843 | ** | ** | .0026 | ** | ** |

** These calculations for the last interval are meaningless.

Table A.6.1 Relative risk of demographic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | N | RR | N | RR | N | RR | N | RR |
| Sex of the child | | | | | | | | |
| Male | 17633 | 1.00 | 17622 | 1.00 | 19927 | 1.00 | 19881 | 1.00 |
| Female | 16350 | 0.82 | 16335 | 0.83 | 18701 | 0.78 | 18664 | 0.78 |
| Birth Order | | | | | | | | |
| 1st birth | 8623 | 1.00 | 8617 | 1.00 | 10037 | 1.00 | 10017 | 1.00 |
| 2nd birth | 7513 | 0.89ns | 7508 | 1.43 | 8485 | 0.94ns | 8468 | 1.52 |
| 3rd birth | 5759 | 0.98ns | 5754 | 1.75 | 6507 | 0.98ns | 6494 | 1.71 |
| 4th birth | 4244 | 0.91ns | 4239 | 1.61 | 4572 | 0.99ns | 4564 | 1.71 |
| 5th birth | 2941 | 1.02ns | 2938 | 1.75 | 3241 | 1.24 | 3234 | 2.05 |
| 6th birth + | 4903 | 1.32 | 4901 | 1.96 | 5786 | 1.58 | 5768 | 2.31 |
| Preceding interval | | | | | | | | |
| First birth | 8623 | 0.47 | a | a | 10037 | 0.43 | a | a |
| < 19 months | 3758 | 1.00 | 3767 | 1.00 | 3900 | 1.00 | 3886 | 1.00 |
| 19-36 months | 11444 | 0.46 | 11436 | 0.54 | 12075 | 0.50 | 12054 | 0.58 |
| > 36 months | 10148 | 0.30 | 10137 | 0.37 | 12616 | 0.30 | 12588 | 0.37 |
| Survival of previous child | | | | | | | | |
| First birth/alive | 30841 | 1.00 | 30819 | 1.00 | 35367 | 1.00 | 35292 | 1.00 |
| Death | 3142 | 2.97 | 3138 | 2.44 | 3261 | 2.91 | 3253 | 2.26 |
| Age of mother at child birth | | | | | | | | |
| < 20 years | 5258 | 1.00 | 5254 | 1.00 | 5202 | 1.00 | 5192 | 1.00 |
| 20-24 years | 10864 | 0.64 | 10856 | 0.71 | 11615 | 0.77 | 11593 | 0.85 |
| 25-29 years | 9004 | 0.57 | 8998 | 0.67 | 10787 | 0.68 | 10764 | 0.75 |
| 30-34 years | 5482 | 0.63 | 5477 | 0.71 | 6902 | 0.77 | 6885 | 0.78 |
| 35-39 years | 2630 | 0.75 | 2628 | 0.81ns | 3250 | 0.91ns | 3243 | 0.86ns |
| > 39 years | 745 | 0.89ns | 744 | 0.99ns | 872 | 1.01ns | 868 | 0.94ns |
| Age of mother at first marriage | | | | | | | | |
| < 15 years | 5121 | 1.00 | 5117 | 1.00 | 5032 | 1.00 | 5024 | 1.00 |
| 15-19 years | 18749 | 0.81 | 18740 | 0.88 | 20093 | 0.73 | 20048 | 0.83 |
| 20-24 years | 8209 | 0.58 | 8201 | 0.73 | 10778 | 0.54 | 10758 | 0.68 |
| 25-29 years | 1606 | 0.48 | 1606 | 0.59 | 2337 | 0.53 | 2327 | 0.70 |
| > 29 years | 298 | 0.64ns | 293 | 0.69ns | 388 | 0.80ns | 388 | 0.93ns |
| Birth cohort | | | | | | | | |
| 10 to 15 years before survey | | 1.00 | - | - | | | - | - |
| 5 to 10 years before survey | 17988 | 0.96ns | - | - | 18515 | 1.00 | - | - |
| 5 years before survey | 15995 | 0.85 | - | - | 20113 | 0.82 | - | - |
| Number of mother in union | | | | | | | | |
| Once | 30644 | 1.00 | 30644 | 1.00 | 35310 | 1.00 | 35310 | 1.00 |
| More than once | 3313 | 1.40 | 3313 | 1.26 | 3235 | 1.51 | 3235 | 1.32 |

Source: Primary analysis of the 1991 and 1994 IDHS, using Cox regression proportional hazard model.

Note : RR Relative risks

ns Not significant at 5 per cent

a Linearly dependent covariate with first birth order

\- Exclude in the multivariate model

Table A.6.2 Relative risk of regional factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | N | RR | N | RR | N | RR | N | RR |
| Place of residence | | | | | | | | |
| Urban | 9630 | 1.00 | 9630 | 1.00 | 9730 | 1.00 | 9730 | 1.00 |
| Rural | 24353 | 1.54 | 24353 | 1.51 | 28898 | 1.74 | 28898 | 1.66 |
| Group of island | | | | | | | | |
| Java-Bali | 9898 | 1.00 | 9898 | 1.00 | 9328 | 1.00 | 9328 | 1.00 |
| Sumatra | 11140 | $0.95^{ns}$ | 11140 | 0.86 | 11913 | $1.09^{ns}$ | 11913 | $1.00^{ns}$ |
| Kalimantan | 3891 | 1.22 | 3891 | $1.10^{ns}$ | 4923 | 1.29 | 4923 | 1.19 |
| Sulawesi | 3947 | $0.98^{ns}$ | 3947 | $0.88^{ns}$ | 4990 | 1.24 | 4990 | $1.13^{ns}$ |
| Eastern Indonesia | 5107 | 1.43 | 5107 | 1.26 | 7474 | 1.23 | 7474 | $1.05^{ns}$ |
| Ability to speak Indonesian language | na | na | na | na | | | | |
| Yes | | | | | 33043 | 1.00 | 33043 | 1.00 |
| No | | | | | 5585 | 1.32 | 5585 | 1.22 |

Source: Primary analysis of the 1991 and 1994 IDHS, using Cox regression proportional hazard model.
Note : RR Relative risks
ns Not significant at 5 per cent
na Not available in 1991 IDHS

Table A.6.3 Relative risk of socio economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | N | RR | N | RR | N | RR | N | RR |
| Education of mother | | | | | | | | |
| Complete secondary + | 6008 | 1.00 | 6007 | 1.00 | 5381 | 1.00 | 5378 | 1.00 |
| Complete primary | 9094 | 2.21 | 9077 | 1.32 | 14406 | 1.67 | 14379 | 1.40 |
| No education/some | 18881 | 3.09 | 18874 | 1.34 | 18841 | 2.54 | 18821 | 1.67 |
| Education of father | | | | | | | | |
| Complete secondary + | 9147 | 1.00 | 9146 | 1.00 | 8093 | 1.00 | 8081 | 1.00 |
| Complete primary | 10080 | 1.82 | 10064 | 1.35 | 15359 | 1.55 | 15348 | $1.15^{ns}$ |
| No education/some | 14756 | 2.26 | 14748 | 1.53 | 15176 | 2.20 | 15149 | 1.35 |
| Ability to read letter/newspaper | | | | | | | | |
| Easily | 19669 | 1.00 | 19644 | 1.00 | 24356 | 1.00 | 24319 | 1.00 |
| With difficulty/not at all | 14314 | 1.57 | 14314 | 1.19 | 14272 | 1.64 | 14259 | 1.18 |
| Read newspaper once a week | | | | | | | | |
| Yes | 8347 | 1.00 | - | - | 8898 | 1.00 | - | - |
| No | 25611 | 1.77 | - | - | 29680 | 1.60 | - | - |
| Father's occupation | | | | | | | | |
| Professional, manager | 2371 | 1.00 | 2367 | 1.00 | 3118 | 1.00 | 3110 | 1.00 |
| Clerk | 2240 | $0.99^{ns}$ | 2240 | $0.95^{ns}$ | 2459 | $1.15^{ns}$ | 2459 | $1.12^{ns}$ |
| Sales/service | 9703 | 2.10 | 9701 | 1.44 | 5640 | 1.44 | 5635 | $1.04^{ns}$ |
| Industrial worker | 1767 | 1.90 | 1767 | $1.28^{ns}$ | 7976 | 1.58 | 7970 | $1.09^{ns}$ |
| Agriculture worker | 17731 | 2.53 | 17712 | 1.49 | 18713 | 2.08 | 18682 | 1.25 |
| Never work | 171 | 3.07 | 171 | 2.21 | 722 | 2.20 | 722 | 1.47 |

Source: Primary analysis of the 1991 and 1994 IDHS, using Cox regression proportional hazard model.
Note : RR Relative risks
ns Not significant at 5 per cent
\- Exclude in the multivariate model

Table A.6.4 Relative risk of socio-economic factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | N | RR | N | RR | N | RR | N | RR |
| Ownership of the house | na | na | na | na | | | | |
| Own, mortgage | | | | | 32171 | 1.00 | 32153 | 1.00 |
| Rent, contract | | | | | 2617 | 0.60 | 2617 | 0.74 |
| Official | | | | | 1629 | 0.54 | 1629 | 0.69 |
| Other | | | | | 2211 | 1.02[ns] | 2210 | 1.07[ns] |
| Availability of electricity | | | | | | | | |
| Yes | 15414 | 1.00 | 15394 | 1.00 | 19893 | 1.00 | 19893 | 1.00 |
| No | 18539 | 1.50 | 18535 | 1.21 | 18716 | 1.42 | 18716 | 1.12 |
| Television | | | | | | | | |
| Have tv | 10203 | 1.00 | 10192 | 1.00 | 13929 | 1.00 | 13923 | 1.00 |
| Doesn't have tv but watch tv | 8433 | 1.82 | 8426 | 1.66 | 10093 | 1.63 | 10060 | 1.38 |
| Doesn't have and watch tv | 15347 | 1.78 | 15311 | 1.55 | 14636 | 1.52 | 14625 | 1.21 |
| Ownership of stove | | | | | | | | |
| Yes | 12245 | 1.00 | - | - | 14467 | 1.00 | 14464 | 1.00 |
| No | 21691 | 1.34 | - | - | 24161 | 1.50 | 24145 | 1.17 |

Source: Primary analysis of the 1991 and 1994 IDHS, using Cox regression proportional hazard model.

Note : RR Relative risks
ns Not significant at 5 per cent
na Not available in 1991 data set
\- Exclude in the multivariate model

Table A.6.5 Relative risk of housing factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | N | RR | N | RR | N | RR | N | RR |
| Main material of the floor | | | na | na | | | | |
| Tile/ceramic | 3762 | 1.00 | | | 517 | 1.00 | 517 | 1.00 |
| Concrete, brick | 11044 | 1.43 | | | 13732 | 1.91 | 13712 | 1.79 |
| Bamboo/wood | 10936 | 1.94 | | | 12295 | 2.62 | 12285 | 1.63[ns] |
| Other | 8241 | 1.86 | | | 12021 | 2.03 | 12016 | 1.33[ns] |
| Main material of the roof | na | na | na | na | | | | |
| Concrete, tile, asbestos, zinc | | | | | 27074 | 1.00 | 27011 | 1.00 |
| Wood | | | | | 2289 | 1.23 | 2275 | 1.02[ns] |
| Leaves, other | | | | | 9265 | 1.39 | 9244 | 1.14 |
| Main material of the wall | na | na | na | na | | | | |
| Brick | | | | | 14107 | 1.00 | 14086 | 1.00 |
| Wood | | | | | 16165 | 1.34 | 16145 | 0.80[ns] |
| Bamboo, other | | | | | 8319 | 1.60 | 8299 | 0.98[ns] |
| House type | na | na | na | na | | | | |
| Type I | | | | | 12072 | 1.00 | 12072 | 1.00 |
| Type II | | | | | 7166 | 1.24 | 7166 | 1.33 |
| Type III | | | | | 19390 | 1.54 | 19292 | 1.82 |

Source: Primary analysis of the 1991 and 1994 IDHS, using Cox regression proportional hazard model.

Note : RR Relative risks
ns Not significant at 5 per cent
na Not available in 1991 data set

House type
Type I: Floor: Tile/ceramic/concrete
Wall : Brick
Roof : Concrete/tile/asbestos/zinc
Type II: Floor: Concrete/dirt/other
Wall : Brick/bamboo/other
Roof : Concrete/tile/asbestos/zinc
Type III: Floor: Concrete/dirt/other
Wall : Bamboo/other
Roof : Leaves/other

Table A.6.6 Relative risk of sanitation factors contributing to infant mortality, Indonesia, 1991 and 1994 IDHS

| Variable | 1991 | | | | 1994 | | | |
|---|---|---|---|---|---|---|---|---|
| | Univariate | | Multivariate | | Univariate | | Multivariate | |
| | N | RR | N | RR | N | RR | N | RR |
| Source of drinking water | | | | | | | | |
| Pipe to residence | 3044 | 1.00 | 3044 | 1.00 | 4489 | 1.00 | 4489 | 1.00 |
| Pump/well | 20939 | 1.80 | 20939 | 1.40 | 17498 | 1.65 | 17498 | 1.27 |
| Other | 10000 | 2.19 | 10000 | 1.52 | 16641 | 2.17 | 16641 | 1.48 |
| Type of toilet facility | | | | | | | | |
| Private with septic tank | 5858 | 1.00 | 5858 | 1.00 | 6692 | 1.00 | 6692 | 1.00 |
| Private no septic tank | 10291 | 1.58 | 10291 | 1.46 | 9340 | 1.71 | 9340 | 1.54 |
| Shared/Public | 2911 | 1.63 | 2911 | 1.51 | 3359 | 1.88 | 3359 | 1.72 |
| Other | 14923 | 2.37 | 14923 | 2.12 | 19237 | 2.45 | 19237 | 2.10 |

Source: Primary analysis of the 1991 and 1994 IDHS, using Cox regression proportional hazard model.

Note : RR Relative risks
ns Not significant at 5 per cent

Table A.7.1 Percentage of illiterate population according to province, 1995 Intercensal Survey

| Province | Urban | Rural | Total |
|---|---|---|---|
| Sumatra | **3.2** | **9.0** | **7.2** |
| Aceh | 2.8 | 11.1 | 9.4 |
| North Sumatra | 2.7 | 7.4 | 5.4 |
| West Sumatra | 3.1 | 8.3 | 6.9 |
| Riau | 2.8 | 7.1 | 5.6 |
| Jambi | 3.6 | 9.1 | 7.5 |
| South Sumatra | 3.9 | 9.1 | 7.5 |
| Bengkulu | 2.6 | 11.0 | 8.8 |
| Lampung | 4.8 | 10.4 | 9.4 |
| Java-Bali | **6.7** | **18.4** | **13.5** |
| Jakarta | 2.4 | - | 2.4 |
| West Java | 4.1 | 11.1 | 8.0 |
| Central Java | 10.2 | 18.1 | 15.5 |
| Yogyakarta | 11.1 | 22.8 | 16.0 |
| East Java | 10.2 | 25.1 | 20.2 |
| Bali | 11.0 | 22.7 | 18.6 |
| Kalimantan | **5.6** | **13.2** | **10.8** |
| West Kalimantan | 8.6 | 18.9 | 16.5 |
| Central Kalimantan | 3.9 | 6.0 | 5.5 |
| South Kalimantan | 4.9 | 10.6 | 8.8 |
| East Kalimantan | 4.6 | 11.8 | 8.1 |
| Sulawesi | **6.1** | **15.8** | **13.2** |
| North Sulawesi | 1.6 | 3.4 | 2.9 |
| Central Sulawesi | 3.5 | 9.8 | 8.4 |
| South Sulawesi | 8.0 | 22.2 | 18.1 |
| Southeast Sulawesi | 6.6 | 15.1 | 13.1 |
| Eastern Indonesia | **7.6** | **25.7** | **22.1** |
| West Nusa Tenggara | 15.2 | 28.4 | 25.8 |
| East Nusa Tenggara | 5.0 | 21.3 | 18.9 |
| East Timor | 18.2 | 52.1 | 48.8 |
| Maluku | 2.6 | 6.8 | 5.7 |
| Irian Jaya | 3.3 | 37.2 | 28.0 |
| **Indonesia** | **6.1** | **16.3** | **12.6** |

Source: CBS, 1996c

Table A.7.2 Ratio community health centre (CHC), hospital, doctor and bed in hospital per 1,000,000 population according to province, 1991.

| Province | CHC | Hospital | Doctor | Bed |
|---|---|---|---|---|
| **Sumatra** | **35** | **6.8** | **84** | **657** |
| Aceh | 45 | 5.7 | 76 | 469 |
| North Sumatra | 30 | 9.6 | 98 | 1059 |
| West Sumatra | 41 | 9.4 | 119 | 802 |
| Riau | 33 | 7.0 | 69 | 440 |
| Jambi | 45 | 5.8 | 70 | 393 |
| South Sumatra | 33 | 5.9 | 84 | 649 |
| Bengkulu | 74 | 5.7 | 129 | 364 |
| Lampung | 26 | 2.6 | 46 | 264 |
| **Java-Bali** | **26** | **4.1** | **94** | **579** |
| Jakarta | 37 | 9.9 | 292 | 1615 |
| West Java | 22 | 2.6 | 59 | 344 |
| Central Java | 26 | 4.3 | 74 | 563 |
| Yogyakarta | 39 | 7.9 | 251 | 1141 |
| East Java | 26 | 3.3 | 80 | 507 |
| Bali | 35 | 9.3 | 179 | 913 |
| **Kalimantan** | **62** | **8.2** | **92** | **664** |
| West Kalimantan | 55 | 5.4 | 77 | 561 |
| Central Kalimantan | 76 | 7.6 | 93 | 338 |
| South Kalimantan | 67 | 9.0 | 75 | 636 |
| East Kalimantan | 66 | 12.6 | 141 | 1134 |
| **Sulawesi** | **44** | **8.3** | **104** | **725** |
| North Sulawesi | 51 | 8.7 | 148 | 1015 |
| Central Sulawesi | 47 | 9.1 | 108 | 643 |
| South Sulawesi | 38 | 7.9 | 92 | 689 |
| South East Sulawesi | 62 | 8.6 | 75 | 485 |
| **East Indonesia** | **52** | **7.5** | **65** | **554** |
| West Nusa Tenggara | 30 | 3.5 | 51 | 231 |
| East Nusa Tenggara | 47 | 6.9 | 47 | 500 |
| Timor timur | 78 | 13.0 | 138 | 713 |
| Maluku | 61 | 9.4 | 76 | 822 |
| Irian Jaya | 84 | 12.4 | 81 | 944 |
| **Indonesia** | **33** | **5.4** | **91** | **608** |

Source: Calculated from various sources

Table A.7.3 Regional GDP and GDP per Capita, 1994 (current prices)

| Province | Total GDP (Rp billion) | GDP per Capita (Rp'000) | Index of GDP per Capita (Indonesia=100) (with oil) | Index of GDP per Capita (Indonesia=100) (without oil) |
|---|---|---|---|---|
| Sumatra | | | | |
| Aceh | 11,244.1 [b)] | 3,074.6 [b)] | 156 | 88 |
| North Sumatra | 21,678.6 | 1,989.4 | 101 | 109 |
| West Sumatra | 7,217.9 | 1,704.6 | 87 | 95 |
| Riau | 18,223.5 [b)] | 4,884.1 [b)] | 248 | 106 |
| Jambi | 2,910.8 | 1,280.3 | 65 | 70 |
| South Sumatra | 12,062.1 | 1,732.0 | 88 | 83 |
| Bengkulu | 1,792.4 | 1,333.9 | 68 | 75 |
| Lampung | 6,533.2 | 1,006.6 | 51 | 56 |
| Java-Bali | | | | |
| Jakarta | 58,785.3 | 6,617.3 | 337 | 370 |
| West Java | 62,400.2 | 1,634.5 | 83 | 87 |
| Central Java | 39,303.6 | 1,339.7 | 68 | 71 |
| Yogyakarta | 4,882.3 | 1,673.1 | 85 | 93 |
| East Java | 57,146.5 | 1,705.4 | 87 | 96 |
| Bali | 6,490.6 | 2,263.3 | 115 | 126 |
| Kalimantan | | | | |
| West Kalimantan | 6,050.4 | 1,713.5 | 87 | 96 |
| Central Kalimantan | 3,657.5 | 2,335.7 | 119 | 131 |
| South Kalimantan | 5,294.2 | 1,883.3 | 96 | 105 |
| East Kalimantan | 19,170.7 [b)] | 8,755.9 [b)] | 445 | 245 |
| Sulawesi | | | | |
| North Sulawesi | 3,190.7 | 1,226.6 | 62 | 69 |
| Central Sulawesi | 2,114.3 | 1,129.0 | 57 | 63 |
| South Sulawesi | 8,737.9 | 1,180.1 | 60 | 66 |
| Southeast Sulawesi | 1,510.3 | 992.6 | 50 | 55 |
| Eastern Indonesia | | | | |
| West Nusa Tenggara | 2,960.6 | 828.3 | 42 | 46 |
| East Nusa Tenggara | 2,456.4 | 703.1 | 36 | 39 |
| East Timor | 603.6 | 738.6 | 38 | 41 |
| Maluku | 2,787.0 | 1,376.6 | 70 | 77 |
| Irian Jaya | 5,369.4 | 2,886.1 | 147 | 152 |
| **Indonesia [b)]** | **1,725.7** | **1,965.7** | **100** | **100** |

Source: Calculated from Table 1,5 and 6 (CBS, 1996d)

[a] All Indonesia total GDP is the sum of the provinces and is not taken from the national income statistics.

[b] Includes income from oil